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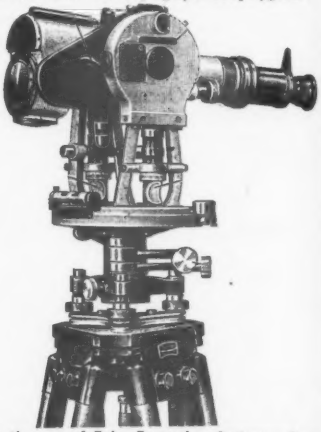

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The
GEOGRAPHICAL JOURNAL

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CAMBRIDGE EAST GREENLAND EXPEDITION, 1929: ASCENT OF PETERMANN PEAK: *A paper read at the Evening Meeting of the Society on 27 January 1930, by*

J. M. WORDIE

THE Cambridge Expedition last summer was the most recent of a series of three, and, as in 1923 and 1926, had as its objective the little-known East Coast of Greenland. On this occasion we were a party of nine: W. F. Whittard, M. M. L. Parkinson, V. E. Fuchs and myself, geologists; R. C. Wakefield and A. Courtauld in charge of survey; V. S. Forbes, geographer; J. F. Varley, medical officer; and P. de K. Dykes, wireless operator. We sailed from Aberdeen on July 2 in the Norwegian ship *Heimland*, captained on this occasion by Karl Jakobsen; his brother, Lars Jakobsen, had been captain of the same ship for the 1926 expedition, and of the smaller *Heimen* in 1923.

A course was set towards Jan Mayen until such time as we could make wireless connection with the Norwegian weather station on the island. Five days later this was accomplished, and our course in consequence altered three points to the west towards the ice edge. It was known that the ice conditions were not altogether favourable, and it was intended therefore to sail directly north-west towards Davy Sound. Last season "the point," as sealers name the angle where the ice edge to the north of Jan Mayen begins to trend to the west, was reputed to be farther east than usual. In deciding to enter the pack west of Jan Mayen we were influenced by this fact, as in such years this route is regarded as a more promising course than the more usual one of reaching latitude 74° or 75° and then turning eastwards through the ice pack.

The Pack ice

We entered the pack ice early on Monday, July 8, in latitude 71° 30′ N., longitude 15° 30′ W. The floes were widely scattered, the weather clear, and progress at first fairly rapid. As a particular point of interest, we noticed the enormous numbers of Little Auks in rapid flight from pool to pool, or standing or lying breast down on the ice floes, waiting sometimes until the ship was nearly upon them: both in colouring and behaviour they appeared to be the counterpart of the Adelie Penguin in the Antarctic. There was a continual twittering from the birds in flight, a contrast to the general stillness felt in the ice. None of us had previously seen Little Auks in such numbers on

the pack edge, being, however, more familiar with the ice farther north in latitudes 73° and 74°. In the next few days we learnt more about the birds. Early each morning they arrived in almost countless flocks flying out of the west; the day was spent among the open pools near the ice edge; in the evening the birds flew westwards again, appearing as dark clouds on the eastern horizon, then passing overhead, and vanishing towards the west. As we went deeper into the ice the numbers of the birds rapidly decreased. Later the Liverpool Coast came in sight, and I remembered how Dr. Koch had once told me that that region is one vast rookery of Little Auks. For their summer feeding therefore it appears they must make the daily journey to and from the ice edge about 60 miles away, keeping however to the same latitude as their nesting sites on the Liverpool Coast. Latitudes 70° and 71° might well be called the Auk Latitudes in contrast to the Bear Latitudes, as Norwegian hunters denote 73° and 74°.

Difficulties were experienced soon after the ice was entered; not only did the rate of progress become slow, but in due course we found ourselves forced between great polar floes, where advance became impossible and the ship was stationary for long periods in situations not of our own choosing. On the night of July 11 a strong north-east gale of force 8 blew at Jan Mayen; although we were about 250 miles away and experiencing only moderate winds, the effect of the distant gale was sufficient to drive the whole body of pack ice towards the Liverpool Coast. One hundred miles of pack were telescoped into 50, and we knew that progress along the route which we had chosen was no longer immediately possible. Another line of attack was necessary, and we decided to seek a passage elsewhere. After some anxious moments we eventually came out of the ice early in the morning of July 13 in 18° 40′ W. longitude. The only likely route appeared to be the traditional one along the parallel of 74°. With this end in view we steered northwards, hoping also that conditions might improve in the two days required to reach that latitude. From daily wireless messages received from the Danish ship *Godthaab*, which had been held up already for eleven days some 40 miles south-east of Little Pendulum Island, it was apparent that the ice situation in the north had not as yet been good.

We entered the pack for the second time early on July 15 in latitude 74° 20′ N., longitude 14° 10′ W. It proved to be an area of small but closely set floes; and at first little progress was possible. For a couple of days, indeed, we were more or less icebound near the pack edge; but about 4 p.m. on July 17 the ice floes developed sudden restlessness, and in the chance which this gave us we began to make westerly progress and ultimately made good about 20 miles, reaching 15° 40′ W. longitude. Soon after we were under way the wind rose briskly from north-east: it is worth noting that the pack had become active before we actually felt the wind freshening.

Thursday July 18 was the first of ten consecutive fine days. In the ice the weather as a rule is foggy and dull, implying probably open water pools of considerable area in proportion to ice floes: during settled weather there is generally a low mist over the pack, and the chance of progress is often lost just when pack and weather are at their best. Sunny and still weather free from mist must be regarded as a sign that the ice is packed close and tight. This was evident during the next ten days. On July 19 we were practically stationary.

Wollaston Foreland was in full view, heightened and distorted by mirage. The next day we advanced some 15 miles and were then stopped among polar floes in 16° 20′ W. longitude. Two days later this position became untenable; a retreat however was no longer easy. Six hours' work and a plentiful use of dynamite were necessary to carry us through an ice neck about 200 yards in breadth; but thereafter the pack opened a little, and we found ourselves in fairly open leads. Steaming first to east and then southwards on July 22, we made a fresh drive towards the west.

On July 23 the way at first for some 15 miles was among small floes with plenty of water, but late that night we were stopped once more among great polar floes. The weather remained still; the ice closed a little; and we were held firm and close in this same region without possibility of escape for no less than seven days. We were now in longitude 17° 30′ W. Great polar floes, of a thickness and age undreamt of in the Antarctic, formed as it were an almost immovable framework; between them small floes, of a size hardly possible to edge and push with our limited steam power, in effect acted as a cement. Our immediate object was to get anywhere from an awkward situation, but also, if possible, to reach an area of open water about 6 miles away to the north, and probably most easily reached by a north-east course. Continually we strove to escape from a situation where crushing of the ship was only too likely to occur. With ice chisels and dynamite some space was made; we jostled and pushed the floes, but the only result of an hour's work might be an advance of less than 100 yards. Movement of any sort however was the exception and the record of that week is of almost complete immobility.

During these days we were in constant wireless touch not only with the Norwegian shore stations at Jan Mayen and Mackenzie Bay, but also with two other expedition ships also bound for East Greenland. Dr. Koch's Danish expedition in the *Godthaab* had reached Clavering Island on July 21 after nineteen days in the ice, and the Norwegian expedition in the *Veslekari* reached land-water at Sabine Island on July 28. We ourselves still remained helplessly icebound. News had also been received that two Aalesund hunting ships had reached Mackenzie Bay without any difficulty; their route had taken them rapidly through the pack off the mouth of Scoresby Sound, and thence northwards in land-water without difficulty straight to Mackenzie Bay. These two ships had as their objective walrus hunting on the Belgica Bank in 78° N. lat.; the conditions however were most unfavourable for such work, and both, after learning of the ice difficulties, made other arrangements for their summer hunting. We were, of course, too far committed in the ice to be able to profit by the knowledge of their route.

Among the polar floes we had frequently noticed surface dirt layers. It had been a natural assumption to regard them as indicating floes which during their course might have passed near inshore, during which time wind might have blown fine dust from off the bare land cliffs on to their upper surfaces. Detained in the ice, we were able to examine these floes more closely. The material of the dirt was a very fine mud of glacial type, and it appeared therefore a more likely supposition to attribute their origin to glacial rivers flooding over the inshore pack-ice during the thaw season. In turn this second hypothesis also had its difficulties, when Varley found marine shells among the fine mud. This

interesting discovery gave a stimulus to searching expeditions far over the floes. To claim the mud by itself as surface-deposited material presented little difficulty, but to do so for marine shells as well was by no means easy. Forbes advanced the view that mud and shells had been frozen in from below, and reached the surface of the floes by the eventual melting off of the overlying ice in succeeding summers. Whatever the correct explanation, we had at least a problem on which to work, and one which may have important bearings on the presence in the British Isles of marine shells in boulder clay.

On July 29 the weather at last showed signs of change. In the forenoon the pack suddenly became active, clouds appeared from the north-east, and a slight wind followed from the same quarter. The floes were now in motion, and ice pressures endangering the ship seemed more than likely. Shortly afterwards the expected nip took place and the ship rose by the stern; a few hours later she refloated, fortunately undamaged. The next day she lifted a second time, but at the bows; this had the effect of launching her back, and the propeller and rudder became involved; again she refloated, but the rudder, a thick sheet of iron, had been bent through 30°. There was a third nip the same afternoon (July 30), and the ship was held fast, but apparently safe. Her hull at least was secure, for below the water-line the thick floes carried massive flanges, which had been not the worst but at least a minor trouble in navigation, and these projections now acted as a cradle when the floes came together during the pressure.

The north-east wind of July 29 came to nothing: there was a light wind from the west the next day, and again a little north-east wind on July 31. That morning moreover the ship freed herself from the third nip, and in the looser ice, no doubt a result of the change of wind, definite progress was again possible. We were able to push north-eastwards at about 1 mile an hour; and were encouraged both by the knowledge that we were at last approaching a big pool which had been our objective for over a week and also by the fact that a stranger ship was making progress, apparently through loose ice, in that same pool. Early on August 1 we reached the pool and the stranger ship.

From then onwards conditions improved. The ship, which we had so unexpectedly met, proved to be the fishing vessel *Gotta* from Iceland: she was outfitted from Reykjavik, and, though small (34 tons) and without ice-strengthening, was bound for Franz Josef Fjord in order to try and capture young musk-oxen and attempt their domestication in Iceland. For three weeks she had been in the ice in positions of difficulty and danger. We were bigger and stronger and were very willing therefore that the smaller ship should take advantage of any progress we should make and follow us through the ice. We were now in 18° W. longitude. In the next twenty-four hours we made about 10 miles of westing. A wind was rising from north-east, and the pack had every sign of activity. Soon afterwards the ship was again in a position of difficulty; but we were heavily committed, and almost recklessly we drove through among small floes which filled a lane between two extremely large polar fields. These were pivoting, and for the fourth time the ship was nipped. This was the worst pressure we had as yet experienced. Even when the floes relaxed a little the danger was not at an end, as large pieces, previously held down under water, were then released and drove violently up to the surface. For a time the stern

Phot. R. C. Wakefield

Looking west and north-west from Outlook Col

Phot. R. C. Wakefield

Panorama from the Battlements, south-west to north-west

was lifted several feet, and the ship tilted over about 10°. Some hours later the pressure eased as suddenly as it had begun, and the ship refloated without further apparent damage.

Late on August 2 a run of about 8 miles was possible and took us clear of the very biggest floes to a region of smaller, but broken, polar ice. On August 3 we were still 15 miles from Hold-with-Hope, but in ice surroundings wholly different from any previously experienced. Here was a region of heavy old ice, enclosing great wide pools, the latter still partly covered by level, undisturbed, but half-melted "bay ice." In origin this could only be an area which had been more or less stationary throughout the winter, and now was at last about to break into its original component floes as the cementing bay-ice melted away. There was a thin fog like morning haze. The ship passed through from pool to pool, cutting the thin ice, some of it of overnight formation. Hold-ups were not infrequent; but there was a feeling and conviction that we would soon be through. Early on August 4 the mist cleared and the stillness of the great pools seemed to vanish. Holland Island rose ahead, and at mid-day we reached land water with small scattered floes. The course was immediately set for Cape Broer Ruys (Hold-with-Hope), and in the late afternoon we came to anchor in Mackenzie Bay.

Petermann Peak

On our arrival at Mackenzie Bay, the short Arctic summer was already almost at an end. The flowering plants had withered, and though we still had the sun at midnight, it had now lost much of its power. The colder nights and the short time left before we should have to return made it necessary to carry out the work ashore with more than usual rapidity. We stayed only a few hours at Mackenzie Bay Wireless Station (Mygbukten), landed for somewhat longer at Eleonoren Bay, and pushing west, reached Kjerulf Fjord early on August 6. It was intended that Whittard and Parkinson, using the ship as base, should work on the geology of the pre-Devonian rocks between 72° and 74° N. latitude; Dykes, as wireless operator, had also to stay on board; the remainder, carrying food and equipment for ten to twelve days, were to make Petermann Peak their objective in a general exploration westwards from the mouth of Kjerulf Fjord.

A base was chosen in Kjerulf Fjord rather than at the foot of the Nordenskiöld glacier on the grounds of our experiences there in 1926. On that occasion it had proved impossible to approach the Nordenskiöld glacier nearer than 4 miles owing to close packing of brash ice and broken glacier fragments against the terminal ice cliffs. Last summer there was little or no brash ice, but it was obvious that ice-falls from the glacier and suitable wind conditions while we were ashore might possibly repeat the 1926 experience, and prevent the ship's return to the extreme head of Franz Josef Fjord should it become our base. Vertical rock walls, on both sides of the fjord, were a further difficulty; and there was also the uncertainty of finding a suitable beach which would be clear of the backwash from calving of icebergs from off the glacier face. In preferring to choose a base in Kjerulf Fjord, we were setting ourselves a longer travelling distance, but guarding against unforeseen events. Two Whymper tents, a large rowing boat, and a fortnight's provisions were therefore left at the mouth of the Riddar Valley immediately south of Riddarborgen;

this was done to enable the Petermann party to escape easily from a region obviously unsuitable for wintering, in the event of the ship not being able to return.

With the help of the crew and the non-climbing party we established the first camp late on August 6 at about 3800 feet on fairly gentle slopes above the Riddar Glacier. The others returned downhill and a few hours later sailed from Kjerulf Fjord to carry out their geological programme. We were left a party of six: Wakefield, Courtauld, Fuchs, Varley, Forbes, and myself.

The tents which we carried were of Mummery pattern, three in number, made of light material and modified for our particular purpose by having broad skirting and detachable ground sheet; the weight of a single tent was a little over 6 lbs. Each sleeping-bag weighed 4–5 lbs. and consisted of an inner bag of eider-down fastened inside an outer bag of fine down. The heavier items were the climbing ropes, crampons, primus stoves, and paraffin. In addition the survey equipment weighed 55 lbs.; this included a specially constructed 3¼-inch Watts theodolite weighing with legs 20 lbs. Of food the daily ration was very little more than 1½ lbs. per man per day: for the six men the total daily consumption was 3–4 lbs. pemmican, 2 lbs. sugar and oatmeal, 2 lbs. chocolate, and 2 lbs. biscuits. This was definitely a low ration, but saving of weight was absolutely necessary if we were to succeed in covering a reasonable distance. We found that L-shaped Everest carriers with detachable sacks were much more convenient for our varied loads than the more common frame-rucksack of Bergans Meis type.

The first three days were hardly pleasant ones, for we were carrying much heavier packs than one would have liked after a month's inactivity on board ship. We were working at a height of about 7000 feet, that is to say, above the snow-line, and dependent largely on melted ice for drinking-water. The surveyors mapped the region of the Cambridge Peaks; Forbes and Varley brought extra food up from sea-level; and a general reconnaissance took place. On August 10 we left a small food depot at Outlook Col, and travelled westwards along the watershed between the Nordenskiöld glacier on the north and the tributaries to the head of Kjerulf Fjord on the south. Partly we followed the zigzag ridge, partly we shortened the route by making short snow traverses; and finally, after a rough descent of about 700 feet, half rock, half scree, we reached a suitable camping-ground at the head of the Mercanton glacier. Some snow fell during the night. Since leaving the fjord the weather conditions had been discouraging, mist and cloud having prevailed for two out of the four days.

The routine of the work varied little from day to day. We roused out after some seven to eight hours' sleep, the Primus was at once lit, and the breakfast pemmican ready in less than half an hour. As we were carrying chronometer watches we kept throughout to Greenwich Mean Time; and as locally we were two hours later than Greenwich, we appear to have practised not one but two hours of daylight saving. Whatever the time, therefore, at which we began the day, we were always two hours to the good, and thus benefited generally by warmer hours while on the march. Tents were struck and we were usually under way about one and a half to two hours after waking. Lunch, consisting of chocolate, sugar, and biscuits, was generally more of a rest than a meal. In the matter of camp sites we were particularly fortunate; on no occasion

did we have to sleep on snow, as a moraine or fairly comfortable talus seemed always available at the proper time. This circumstance meant a great deal, because sleeping-bags remained perfectly dry throughout the trip, and the degree of comfort arising from this helped no doubt to counterbalance the close rationing. In another respect also we were fortunate, as at only one camp (among the Cambridge Peaks) was it necessary to melt ice for water.

On August 11 the mountains were again in mist; but in the early afternoon, while at Sentinel Col, the clouds cleared and the weather steadied for the next four days. We had reached Sentinel Col with the higher peaks shrouded, and during the short halt were forced to shelter from a searching wind, undecided what our next step should be. Prospects rapidly changed, however, as the mist thinned, and Petermann Peak came clear to view. Forbes immediately led Fuchs and Varley up the Knuckle, while the rest of us climbed the Sentinel: from these two mountains, south and north of the col, we obtained most important data for deciding a further route. Not only was it evident that a great glacier barring our way was the Nordenskiöld and must therefore be crossed, but we also picked out details on the far side of the glacier which influenced our programme even four days later. The Sentinel became a key position in the survey; about halfway between Kjerulf Fjord and Petermann Peak, it commanded almost all the important features ultimately to appear on the map. North we could just see the terminal ice cliffs of the Nordenskiöld glacier; east were the Cambridge Peaks, and far off Payer Peak, climbed in 1870; south we looked down the Mercanton glacier flanked and commanded by Mount Lauge Koch; while westwards was the wide and imposing sweep of the Nordenskiöld glacier round the base of Petermann Peak. That same night we dropped down the upper part of the Ptarmigan glacier to where it became "dry glacier" and established our fourth camp among boulders at 5900 feet.

Camp IV was the first of the more comfortable camping-grounds. We were at lower levels than formerly, and flowers were numerous on the neighbouring slopes; the ground faced south, and there was water in plenty; and we had learnt by now some of the secrets of floor arrangement. On August 12 a route was prospected down the Ptarmigan icefalls, Forbes took a relay party to Outlook Col and back, and a survey station was established on the Battlements above the camp. From the latter position we witnessed a spectacular rockfall on the south side of the Nordenskiöld glacier near the Lion Bastion, at a place where we had just planned that our way should lie. We saw a thick white cloud down by the glacier, but it soon broke up, and about a quarter of an hour later a thinnish cloud passed over us and darkened the sun: we were at least 10 miles from the scene of the rockfall. From the height where we stood we planned our route across the glacier; the chief difficulty, we thought, would be the possibility of rivers in flood, their deep sinuous trenches being plainly visible near two great central moraines.

On August 13, with the comforting knowledge that there would be no more relaying, we left Camp IV and passed downwards in succession over the Upper, the Middle, and the Lower Ptarmigan glaciers. After the fatiguing days above the snow-line it was particularly pleasant to find ourselves on dry firm ice. We threaded a way down the icefalls of the Upper and Middle glaciers, experiencing a welcome variety of surroundings among great yawning

crevasses and white seracs. From the icefalls of the Middle glacier we crossed the wider and more level Lower Ptarmigan glacier, and so reached Corner Lake, 2300 feet above sea-level, where the Ptarmigan glacier joins the Nordenskiöld. The lake region is approximately at the centre of an intrusion, about 10 miles in diameter, of greyish-white and for the most part porphyritic granite. In sunshine the granite stands out yellowish-white, giving prominence to the veins and stringers injected from it into the near-by brightly variegated brown and yellow-weathering sediments. Over against the lake, on the north side of the glacier, great irregular masses of the brown sediments were seen completely enclosed and floating in the granite. This, to a geologist at any rate, was a very wonderful sight, and not to the geologist only, for from the lake-side in the bright sun the whole colouring and form of these mountain cliffs were quite exceptional.

That same night we worked some 2 miles westward up the south side of the Nordenskiöld glacier, and camped on the right lateral moraine. The next morning, August 14, we travelled a further 1½ miles along the south side, and then crossed the 4-mile-wide Nordenskiöld glacier without undue difficulty. At this level, 2800 feet, the surface of the glacier was clear of snow, and the two potential rivers near the central moraines no longer in flood; in both these respects the lateness of the season was definitely to our advantage. The north side of the glacier was reached a little above the inflow of the Disa glacier. Steep cliffs farther up the main glacier gave little promise of an easy route, and an easterly detour had therefore been planned. We climbed over granite, glacier-polished to a height of over 1500 feet above the present surface of the ice, and after a short traverse camped ultimately at 5500 feet beside the Disa glacier. Varley's boots gave out that day, and it was evident that the only chance of his getting back to the coast with any foot covering at all was to cease further rock and scree climbing; we left him rather reluctantly in solitary camp down by the main glacier.

From the head of the Disa glacier on August 15 we crossed a high col at 7170 feet, dropped 1200 feet, and then contoured across the westerly slopes of the Gregory glacier at a height not much above the snow-line. From the Disa glacier camp the slopes under the south-west ridge of Petermann Peak were reached in about six hours. The weather, after four exceptionally fine days, now showed unmistakable signs of breaking: should it break, we knew it was not possible to wait for improved conditions, as we were short of food and would soon be overdue at the ship. The only chance of climbing Petermann was to do so at once. We ascended rapidly up hard snow slopes sheltered from the west, and finally were on the crest of the south-west ridge about 5 p.m. local time, the height being 8200 feet. The ridge presented the usual climbing features, occasional rock pitches and short connecting ice patches, both requiring caution. Mounting steadily we reached a point about 100 feet below the summit at 7.30 p.m. Here we suffered a check; ahead was an ice cone, on which step cutting would take fully an hour. As soon as we halted we realized that the morning breeze had become a really strong gale, and once inactive we were soon bitterly cold. To attack the ice slope direct seemed out of the question. Leaving Courtauld and Fuchs behind, Wakefield, Forbes, and myself traversed west along the foot of the steep ice slope, and reached the

rocky north-west face. We were now fully exposed to the wind and on ice-glazed rocks where the climbing was much more difficult. Nearly an hour passed before we reached the top of the rocks and ultimately stood on top of the ice slope, though it was only 100 feet above where we had left Fuchs and Courtauld. We shouted to them that they must return down the south-west ridge. The gale was now force 8. Before leaving, however, Courtauld accomplished the feat of boiling water and taking hypsometer readings to determine the height, Fuchs meanwhile acting as a wind screen. The ice cone was separated by a drop of 30 feet from a still higher but rocky point. When prospecting the mountain from a distance this gap had appeared as a possible difficulty: it was the reverse, however, and we were able to climb across it with ease and so reach the actual summit. The gale was now at its height, and to maintain ourselves steady we had to adopt a semi-crouching position. We managed to avoid frostbite.

While a record was being prepared, Wakefield took a round of photographs. It was evident that no mountain higher than Petermann was in sight. The aneroids all read over 10,000 feet, but corrections later make the accurate height 9650 feet. Mount Shackleton proved ultimately to be about 9000 feet: beyond it and slightly to the left we could see a region of high mountains which may quite possibly be Scoresby's Werner Mountains. The main interest, however, lay north-east down the line of the Gregory glacier: what appeared to be a thin rock ridge ran across the line of the valley, and the upper reaches would therefore seem to drain into the Nordenskiöld glacier, swinging round the north side of the peak 8480 feet in height which Nathorst in 1899 mistook for the real Petermann Peak. The Gregory valley, however, continues straight on as a broad snow-and-ice feature towards the north-east. In the line of this valley and beyond the ice were seen one large and two smaller lakes, lying apparently in ice-free country. Beyond the lakes again was the curve of a glacier, fully comparable to and perhaps even bigger than the Nordenskiöld; and this we took to be an inland portion of the Jätte glacier, draining to Ice Fjord. Below us the Nordenskiöld glacier was seen to have its head region about 20 miles south-south-west, west therefore of Mount Shackleton. Above a prominent nunatak, from which springs one of the central moraines, the glacier widens towards the ice-cap, but does not appear to change its slope, continuing to rise about 1000 feet in every 5 miles. We judged therefore that the passage from highland to continental ice might be placed about 15 miles west of where we stood, that is to say, in about 30° 30′ W. longitude. Separating us from the ice-cap on the western horizon was high ground similar to that passed through above the Ptarmigan glaciers, but on the whole less broken up by mountains: it would be difficult to say definitely where mountains stopped and nunataks began. We tried to decide how the ice-cap might most easily be reached: there are two ways, one by the Nordenskiöld Glacier and the nunatak, the other by the Gregory Glacier, but involving a steeper climb; both routes, at least in summer, would require considerable portaging before sledges could be used. This distance, however, might be reduced in the former case to 20 miles, in the latter possibly to 12, if the journey could be made from the foot of the Nordenskiöld glacier and not from Kjerulf Fjord.

In our cold and exhausted condition we were not anxious to return by the

exposed route up which we had come, more especially as a possible and certainly sheltered way could be seen below us on the south-east ridge. It proved less difficult than we expected; we passed down over ripple-marked quartzites, pink and green in colour, then over black shales, and in a little over three hours reached the foot of the ridge. Here at 7950 feet we struck diagonally west and down a snow apron, and about 2 a.m. on August 16 rejoined the others already in camp.

The site which Courtauld and Fuchs had chosen was on the moraine on the south side of the ice-slope or apron which wraps round the foot of the upper 3000 feet of Petermann Peak, and immediately above the steep and difficult cliffs overlooking the Nordenskiöld glacier about 3000 feet below. It made a splendid outlook point and station for survey work: the gale had not yet blown itself out, but Wakefield, after only a few hours' rest, carried on in spite of the cold wind. Later in the day we broke camp, and, returning as we had come, ultimately reached Varley at his tent by the Nordenskiöld glacier. On August 17, in a tired state, we were able to reach Camp IV; and an exceedingly long day on the 18th took us back over Sentinel and Outlook Cols, and so down to sea-level, where the ship was already waiting our return.

Caledonian Earth Movements

Mention has been made of the granite intrusion round the Corner Lake region and of the ripple-marked quartzites on Petermann Peak: the occurrence there of little-altered sedimentary rocks was in the nature of a surprise. We estimated the thickness of these sediments as at least 3500 feet, but this estimate is probably on the low side. Weathering brown and yellow, they form as a rule prominent cliffs, and particularly so on the north side of the Gregory glacier, where the valley runs more or less parallel to the strike of the beds. Seen closer, they prove to be mainly grey, green, and pink quartzites; papery shales were also found. We did not find any fossils, and regarded these beds as most probably pre-Cambrian in age. Ultimately they may be found to correspond with certain members of the Franz Josef Beds, but at present it seems desirable to name them independently as the Petermann Series. Recently descriptions have become available of sediments collected on Dronning Louise Land by Major J. P. Koch and Dr. Wegener in 1912, and from the preliminary account which I have seen of them it seems not unlikely that they are much the same as the rocks on Petermann. These two outcrops of apparently similar beds are separated by a distance of nearly 200 miles.

In 1926 the most important geological discovery had been the determination of the thrust westwards of Franz Josef Beds over the underlying Metamorphic Complex. The beds involved were found to have been crushed and altered with the production of mylonites and other comparable features. A discovery of this nature was not quite unexpected: Nathorst, the only previous observer, though hardly admitting the occurrence of anything in the nature of mountain building, had nevertheless made it more than likely both from photographs and from his writings that there was pre-Devonian folding in East Greenland on an extensive scale. In 1926 we experienced exceptionally good light conditions in the narrow fjords and obtained a clear picture of the general tectonic conditions both on Suess Land and on Andrée Land. A major thrust was located and

examined at Junction Valley on Andrée Land, about 4 miles north-north-west across Franz Josef Fjord from Cape Mohn. The problem, stratigraphical and tectonic, obviously required further study over wide areas both north and south of the fjord; and this had been one of the main items of the future programme laid down when we came home in 1926. Our late arrival last summer prevented this scheme being carried out as fully as we would have wished; the northern part, for instance, had to be omitted altogether. During the mountain expedition, however, Whittard and Parkinson investigated the region south of Franz Josef Fjord as far as Antarctic Harbour, and later, on the return of the Petermann party, the work was carried a stage further.

The details of this research are at present being worked out, and it is only possible to mention here the main result. The thrust discussed in 1926 was found to belong to a thrust-system, which passes in the south into a reversed fault of considerable vertical displacement in the region of Alp Fjord. The buttress or horst against which the pressures were directed probably lay to the south. Smaller thrusts and overfolds were seen in the cliff-sections in the Franz Josef Beds, while minor structures such as reversed and normal faults and small folds are of common occurrence. These features represent mountain building on an exceptionally large scale, and can be regarded as part of the Caledonian earth-movements.

Mackenzie Bay and Jan Mayen

On August 23 we planned to reach Mackenzie Bay, but were unable to pass east of Cape Franklin; the pack seemed to be eddying into the north side of Foster Bay. We were able however to approach Bontekoe Island, hoping in this way to make Cape Bennett; but this was also impossible, and we gave up the attempt.

At Mackenzie Bay the Norwegian weather station (Mygbukten), which was revived in 1926 after the brief and disastrous experience of 1922–23, has been in continuous operation. Finn Devold is now in charge, and he has nothing but praise for the climate and the conditions at this delightful spot; he speaks with experience of winter conditions both at Spitsbergen (King's Bay) and Jan Mayen. The continuance of the station at Mackenzie Bay has been largely the result of the successful hunting conditions. In 1926 these did not appear very promising, but the number of foxes trapped in the last three years shows the opposite to be true. The original party of six men went home in 1928, and were relieved by the present party. Other Norwegian hunters have been successful on Clavering Island and on Wollaston Foreland, their farthest post being at Lindemann Bay; and last summer a further party of ten men was established on Ymer Island. The chief animals hunted are White and Blue Arctic Foxes; to make a success of the enterprise, however, very large areas have to be covered, and this can only be done with dog teams, fed for the most part on musk-ox meat. Mention has been made of the Norwegian Government expedition in *Veslekari:* one of its activities this summer was the commencement of a closely detailed topographical survey of the area covered by the various hunting units, which extends from Sofia Sound in 73° N. to Kuhn Island, in 75° N.

After our failure to reach Mackenzie Bay we decided to sail for home as soon as possible. We left Dusén Fjord on August 25, but made little progress that

day, being south of Bontekoe Island and east of Cape Mackenzie. The next day we were able to advance somewhat farther and were about 15–20 miles east of Cape Mackenzie in the evening. Still better progress was made in the afternoon of August 27, and in the evening Cape Mackenzie was no longer in sight. Advance generally took the form of a run forward in a favourable lead, followed by detention at a narrow neck, where polar floes were in close contact. On August 28, for instance, we waited at a neck from 9 a.m. till 4 p.m.; then came 8 miles of progress and another neck, which opened after four hours and allowed us to steam forward in wide leads for over 20 miles. Next morning we were stopped among smaller floes, closely set and swaying gently under influence of swell from the open sea, only a few miles distant. The Greenland mountains were still faintly visible over 60 miles away. Everything seemed to be in our favour, yet a few hours later we were in trouble; among the actively moving floes and particularly by reason of the brash ice, the ship lost power of manœuvre, and in an unfortunate moment the propeller was jammed against an ice tongue and the shaft bent. Fog came down a little later and the swell became stronger, but we were unable to move. This was the case all day and also the following night; more than once a general loosening seemed likely, and a bigger head of steam was raised, but to no effect; the floes were not too big to be pushed aside, but brash ice acted as a cement and made such movement impossible. On August 30 the visibility improved, and about noon the ice began to open: the captain drove his ship with all possible energy, regardless as it seemed of knocks and bruises, and determined that this chance should not be lost. We reached open water in the late afternoon, and set a course for Jan Mayen.

Though the return through the pack was not exactly slow, the nature of the ice was obviously such as might easily have prevented us from reaching open water. The return of all four expedition ships took place, however, without mishap. The *Gotta* left Davy Sound on August 20 and passed through the ice in about sixteen hours. Our own passage took five days. The *Veslekari*, after being held for two to three days at Mackenzie Bay, overtook us at Jan Mayen after about six days in the ice. The *Godthaab* was the least fortunate: she appears to have taken about eleven days, being troubled first with fogs and then with gales of exceptional violence. That no ships were crushed in the pack last season can only be ascribed to more than usual good fortune. The ice conditions were, without doubt, fully as bad as in 1923; in August of that year, out of four ships in the ice, *Anni* and *Teddy* were crushed, *Conrad Holmboe* rendered completely unseaworthy, and only *Heimen* allowed to escape. In 1923 the bad conditions were considered the result of almost persistent north-east winds in August. In 1929, by contrast, it was reckoned that the long period of fine weather in July must have interrupted the normal processes, more especially by preventing the usual break-up of the large composite floes into smaller units at a reasonably early date.

We returned to Aberdeen on September 9, but on the way brief stops were made at Jan Mayen Island and at Thorshavn in the Faroe Islands. Less than two days after leaving the ice we were in the neighbourhood of Jan Mayen; birds were numerous and indicated that land was not far off. The island, however, remained hidden among clouds, a not unusual condition; and when the

Phot. R. C. Wakefield

Middle Ptarmigan glacier, Corner Lake and Nordenskiöld glacier in middle distance

Phot. R. C. Wakefield

Looking S.S.W. up Nordenskiöld glacier to inland ice from 8200 ft. on S.W. ridge of Petermann Peak

mist thinned we found that we had overshot our mark and were on the south instead of the more sheltered north side. We steamed round and dropped anchor at Walrus Gat. At Walrus Gat are the remains of boiling factories erected by whale fishers in the early part of the seventeenth century, when the island was in undisputed possession of the Dutch. We counted the remains of at least six cookeries along the short stretch of beach, picking them out by the scattered timber and small collections of old-fashioned flat bricks. The beach is almost covered with discarded bones, presumably of the Greenland whale. The Dutch occupation lasted into the eighteenth century, dying out about two hundred years ago. After a long interval, during which the island was almost forgotten, Norwegian sovereignty has just been proclaimed as from 8 May 1929. To-day, however, the value of the island is not based on the natural resources of the seas around, but depends on the advantage of weather messages sent out daily, and also partly on its being a shelter and point of call for hunting-ships bound to and from the sealing grounds in Denmark Straits.

APPENDIX I. SURVEY

R. C. WAKEFIELD

As the survey work carried out between August 6 and 21 was done almost entirely near the head of Franz Josef Fjord, a short account of previous work there is not out of place. In 1899 Nathorst's ship *Antarctic* penetrated to the head of the fjord, and Dusén, chiefly from the ship, made a plane-table survey based on two astronomical positions—one on the east side of Kjerulf Fjord, and the other on the north side of Franz Josef Fjord opposite the entrance to Kjerulf Fjord. Though there was no opportunity to look for the latter position, a search was made for the former, but with no result. Dusén's survey naturally included only what could be seen from the fjord itself. Not until the Cambridge Expedition of 1926 was there any attempt to extend the map inland. Manley then produced a rough map showing the approximate position and height of Petermann Peak in relation to Kjerulf and Franz Josef Fjords, and indicating the topography of the glaciers and peaks to the west of Riddarborgen.

In 1929 the necessity of immediately undertaking the inland journey prevented the survey starting from either a measured base or even from an astronomical position and azimuth. It was decided that the positions of Cambridge Peaks 1, 2, 3, and of Riddarborgen should be plotted from Manley's rough map, and that the plane-table survey should be based on these four points. A $3\frac{1}{4}$ Watts theodolite was carried as far as Outlook Peak (7885 feet) and used as often as possible, so that, with the help of photographs, the plane-table survey might ultimately be adjusted accurately.

The plane-table was carried actually to the summit of Petermann Peak, and set up at all the most advantageous intermediate points. It can be realized, however, that most of the initial resections had to be at fairly narrow angles; and after Outlook Peak none of the originally plotted points could be picked up except from the Sentinel. On the top of Petermann itself—the only point from which we got an uninterrupted view of the mountains to the north and north-west where they merged into the inland ice—it was unfortunately too windy to

Looking S.S.W. up Nordenskiöld glacier to inland ice from 8200 ft. on Petermann Peak

put up the plane-table; but the rays that were taken from some 300 feet below the summit on the south-eastern ridge have proved most useful in fixing the actual position of Petermann. The resultant plane-table sketch was in very satisfactory agreement with the astronomical observations and also with the photographs, which provided a useful check.

With regard to the theodolite observations, it was a case of making them at times when the party would be delayed for the least possible length of time. Thus it never proved possible to balance any of the longitude observations. Observations for longitude were taken at Cambridge 4, 27° 38′ 40″, and Outlook Peak, 27° 48′ 00″; for latitude at Outlook Col, 73° 02′ 10″, and for azimuth at Cambridge 4 and Outlook Col. It was absolutely essential that these positions should be tied up with Kjerulf Fjord and Dusén's positions. On the day of our return to the ship, after failing to find Dusén's astronomical position on Kjerulf Fjord, a suitable point was chosen on the edge of Kjerulf Fjord opposite Riddarborgen; observations for latitude and longitude were taken together with an azimuth of Cambridge 4. The ship waited overnight so that a balanced longitude might be taken next morning; but here again we were unlucky, as the sun was obscured by clouds for the first time for many days. This astronomical position agreed as far as could be made out with Dusén's position. A substantial cairn was built to mark the position, 73° 09′ 00″ N. lat., 27° 14′ 50″ W. long., on the raised delta of an obvious stream.

Time was carried by two half-chronometer watches, lent by the R.G.S., which had been rated daily on board the *Heimland* by means of the ship's wireless. Although their rates naturally changed somewhat under the rough usage in the mountains, evidence goes to show that they were fairly constant.

The heights inserted on the map have been determined in several ways. A boiling-point thermometer was taken and used at every camp as a basis for the aneroid differences. The Watkin mountain aneroid proved the most satisfactory, the other two ordinary aneroids above about 5000 feet always reading much too high. Vertical angles were taken whenever possible, with either the theodolite or the telescopic alidade. The heights placed on the map are the means of the results (having due regard to their reliability) given by the different instruments. Considering the conditions under which the work was carried out, they have agreed extraordinarily well. The actual height of Petermann has been the most interesting point to settle. Lieut. Payer, when he first saw the mountain in 1870 from Payer Peak—some 80 miles away—estimated its height as 11,000 feet; Nathorst stated that it might be as low as 8000 feet, but his photographs show that he was observing a different mountain. On the 1926 expedition Manley fixed the approximate position for the first time, and by means of an Abney level made the height 10,200 feet, with a probable error of ±200 feet. From observations last summer, however, the height has had to be reduced still more. The combined evidence of the theodolite, the clinometer, and the hypsometer (which was boiled within 100 feet of the summit) point to the mountain being between 9600 feet and 9700 feet. Mount Shackleton, thought in 1926 to be equally high, is 9000 feet. The heights to the west of Outlook Col—except Petermann and Little Petermann—are based entirely on the boiling-point apparatus, and have probable errors of ±50 feet. The other heights have been based on Dusén's height of Riddarborgen (5906 feet);

Lieut. White, who measured its height in 1926, obtained a result 150 feet lower: if this correction were applied it would slightly lower all the heights east of Outlook Col. As Dusén's height is given as a round figure, 1800 metres, and as White used a theodolite for the summit, there is good reason to believe that this correction should be applied.

Apart from new names on the map of the Petermann region, a few further names have had to be added for geological purposes on the general map. These are: Junction Valley on Andrée Land, Deceit Bay in Kempe Fjord, Karl Jakobsen Bay on Ymer Island, and Gully Glacier in Alp Fjord.

The outline of Dusén Fjord on Ymer Island has been supplied by Dr. Koch from the map made by him last summer. His discovery, that Dusén Fjord almost cuts the island in two, alters very considerably the 1899 chart of Nathorst, but at the same time explains Payer's supposition that there were two islands, named by him Petersen Island and Mohn Island in 1870.

APPENDIX II. GEOLOGY

[Preliminary Report]

W. F. WHITTARD

A little more than a century ago William Scoresby junior published the first contribution to the geology of East Greenland between latitudes 72° and 74° N.* The next account was that of the German Arctic Expedition of 1869–70,† which included a description of the rocks collected from the newly discovered Franz Josef Fjord. Later, in 1899, Nathorst established a geological succession, which in its broad outlines is applicable at the present day.‡ He was followed in 1900 by Otto Nordenskjöld,§ and the combined results of these two expeditions have formed the basis upon which later work has been founded.

The second period of geological investigation began with the Cambridge Expedition of 1926, which visited Franz Josef Fjord and Musk-ox Fjord, and most of the coast between Sabine Island and Cape Simpson (Traill Island).‖ Later in the same year Dr. Lauge Koch, from his base at Scoresby Sound, made a winter sledge journey as far north as Germania Land, and as an outcome of his researches he has published the first comprehensive geological map of East Greenland between latitudes 70° 30′ and 77° N.¶

Taking the region as a whole, the sedimentary rocks have an approximate north and south trend, and a prevailing dip to the east. They are traversed by a complex fjord system bounded by great rock walls which clearly exhibit the tectonic structures in the beds.

Jurassic sediments were examined on the south-east side of Antarctic Harbour. A section taken along a spur of a hill which rose to 2600 feet (the

*'Journal of a Voyage to the Northern Whale Fishery.' 1823.
†'Die zweite deutsche Nordpolarfahrt in den Jahren 1869 und 1870.' 1874.
‡*Geol. Fören. Förhandl*, vol. 23, 1901.
§*Medd. om Grønland*, vol. 28, 1907.
‖*Geographical Journal*, September 1927.
¶*Medd. om Grønland*, vol. 73, 1929.

heights are corrected aneroid readings) showed a series of plant-bearing, blue-black shales, surmounted by pale yellow highly micaceous sandstones with poorly preserved plants, belemnites, and bivalves. At a height of 1400 feet, and interbedded with the yellow micaceous sandstones, a dark ironstone band was discovered which yielded ammonites of Callovian age. Fine-grained dolerite dykes of Tertiary age cut across the Jurassic beds.

The Old Red Sandstone consists essentially of maroon and greenish-grey sandstones, flags, and shales, with local developments of pebbly beds especially towards the base, where there is a marked angular discordance between these beds and the underlying rocks. The Old Red Sandstone of East Greenland is hardly distinguishable from similar rocks in the British Isles, and has yielded such primitive fishes as *Holoptychius* and *Asterolepis*. Physical structures characteristic of continental deposits were well displayed, and the Old Red Sandstone sediments were often seen to fill up pre-existing channels, while pebble accumulations, breccias, and mountain-side screes were so preserved that in places it was possible to reconstruct the landscape.

Bounded above by the Old Red Sandstone and below by the gneisses and

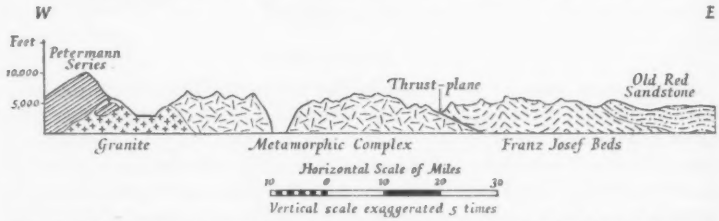


Fig. 1. Diagrammatic section to illustrate the general relationships of the rocks underlying the Old Red Sandstone in the Franz Josef Fjord Region of East Greenland. The shading of the Franz Joseph Beds is conventional

schists of the Metamorphic Complex, there is a thick group of sediments which were first delineated by Nathorst;* later, as a name was required for the whole thickness of these sediments, Wordie termed them in 1927 the Franz Josef Beds.† More recently Koch has subdivided these beds into several parts, of which the lowest is the Eleonoren Bay Formation, defined by him as pre-Cambrian in age.‡ The Franz Josef Beds of East Greenland are comparable as a name with the Hecla Hook of Spitsbergen, and both include Lower Palaeozoic and pre-Cambrian rocks. The Franz Josef Beds consist mainly of limestones, dolomites, quartzites, grits, and slaty rocks. To the east they are unconformably capped by the Old Red Sandstone, while to the west they are thrust from east to west over the underlying Metamorphic Complex (Fig. 1). Two main thrusts were followed from Junction Valley in Franz Josef Fjord to Kempe Fjord; and these are separated in Junction Valley by several hundred

**Geol. Fören. Förhandl*, vol. 23, 1901.

†*Geographical Journal*, 1927, p. 252.

‡*Medd. om Grønland*, 1929, p. 19. The term "pre-Cambrian" is used throughout this Appendix for all rocks older than the Cambrian, whether they are metamorphic, igneous or sedimentary.

feet of sheared rocks which include mylonites. When traced in a southerly direction, however, the thickness of sheared rocks decreases and the thrusts become inclined at a steeper angle, until in Alp Fjord they have passed into a reversed fault of considerable vertical displacement. It seems evident, therefore, that maximum horizontal movement occurred in the north, where there was less resistance to the forces which advanced from the east. The disturbances occurred before the Old Red Sandstone was laid down. Koch has shown that the youngest rocks so far determined in the Franz Josef Beds are to be relegated to the Lower Ordovician, and, as the Franz Josef Beds are involved in the thrusting, the age of the movements cannot be dated at present more closely than post-Lower Ordovician and pre-Old Red Sandstone.

The oldest rocks studied were the gneisses and schists, which are grouped together as the Metamorphic Complex and placed in the pre-Cambrian. The most typical rock-group is that of the biotite-gneisses, but in certain districts crystalline schists were encountered. The tectonic structures in the Complex are intricate. Whereas the earth-movements which disturbed the Franz Josef Beds advanced from the east, there is evidence, as for example in the large recumbent folds of Riddarborgen and at the head of Franz Josef Fjord, that in the case of the Metamorphic Complex forces operated from the north-east and resulted in strike directions aligned north-west, south-east. This period of mountain building is in all probability of pre-Cambrian age, since it is clearly older than the Eleonoren Bay Formation.

The Metamorphic Complex was supposed to extend far to the west underneath the ice-cap, but it was found that the Petermann Peak region is composed of quartzites and shales, which have been named the Petermann Series.* They show considerable resemblance to sediments collected by J. P. Koch and A. Wegener from Queen Louise Land in latitude 76° 20′ N.† The general evidence indicates that the Petermann Series is pre-Cambrian in age, and since the rocks occur on the west of the Metamorphic Complex it may be necessary to postulate overthrusting or overfolding to explain their position. In the region of the Disa, Nordenskiöld, and Ptarmigan Glaciers the eastern junction between the Petermann Series and the Metamorphic Complex is obscured by an intrusion of granite (Fig. 1). The western limit of the Petermann Series was not determined, but the presence of metamorphic rocks in the north median moraine (Nordenskiöld Glacier) which originates from the mountains near the ice-cap, indicates that the Series is succeeded to the west by the Metamorphic Complex.

The trend of the frontal margin of the Caledonian mountains in East Greenland suggests that it is the northerly continuation of the Caledonian Front already determined on the eastern side of North America, which passes under the sea off the coast of Newfoundland.

Geological Magazine, April 1930, p. 151.
†*Medd. om Grønland*, 1929, p. 52.

APPENDIX III. METEOROLOGY

G. MANLEY

The weather conditions experienced by last year's expedition present several features of interest, and in view of the growing number of observations from the coast stations at Mackenzie Bay and Scoresby Sound it should soon be possible to discuss the climate of the coast region north of Davy Sound in detail. The inland fjords, however, have been visited by only four parties, for short periods in the summer, and there are therefore very few data as yet for discussion of the climate inland.

The experiences of the 1929 party are of considerable interest, inasmuch as the weather was more variable than that which favoured the expeditions of 1899 and 1926. In those two years remarkably fine weather was experienced inland; in 1926 a three days' gale at Sabine Island provided the only meteorological event of note. The following is a short review of the meteorological observations kept by the 1929 party.

Weather in the Pack ice

The ship entered the ice in 71° 30′ N., 15° 30′ W., on July 8, with prevailing light variable breezes and intermittent mist for two days. On the 10th rain fell for most of the day with a moderate north-east wind, associated with a depression approaching Jan Mayen from South East Iceland. By noon on the 11th it was clear and fine with light north-east wind, the ship being stationary in rather heavy pack in 71° 33′ N., 19° 25′ W., about 250 miles west by north of Jan Mayen. On the 12th it was still fine, with very light south-east wind; Mackenzie Bay reported similar conditions. This occasioned some comment, as Jan Mayen had reported a northerly gale and rain all night, following upon strong easterly winds the previous day. The edge of the pack lay about halfway between the ship and the island, the ship being in a feeble ridge of high pressure before another shallow low approaching up Denmark Strait. There appears to be nothing remarkable in this difference over 250 miles, and it agrees with the prevailing opinion that conditions in the ice are less stormy. One is inclined to wonder, however, how far the strong northerly gale was confined to the open water, 150 miles wide, between the ice and Jan Mayen.

The next day the ship returned to open water and followed the edge of the ice to 74° 20′ N., 14° 10′ W. on the 15th, after which slow progress was made westward through the ice. Feeble southerly winds were associated with intermittent thick fog during the 15th–17th. Snow fell on the evening of the 17th on a strong north-west wind, associated with a low which had become deeper east of Jan Mayen. Mackenzie Bay and Jan Mayen did not report on that evening; it is uncertain, therefore, whether this storm was an example of the particularly violent and sudden type of the East Greenland coast. The ship's observer reported a sudden beginning of the strong wind at about 8 p.m.

There followed "a week of brilliant weather," pressure being mainly high over the Greenland Sea. A slight low over Northern Greenland moved eastwards on the 21st–22nd. The weather remained fine, with a southerly wind increasing to force 4, and cirrus moving southward on the evening of the 21st. Mackenzie Bay on the same morning had reported a feeble northerly wind.

On the 23rd the advent of a deepening low east of Jan Mayen gave a strong northerly gale at that station, and a moderate north wind at Mackenzie Bay. The ship 100 miles east-north-east of the latter station reported nearly calm weather with feeble southerly winds, but Ci. St. moving rapidly from north-west. This observation seems somewhat remarkable.

Fine weather and sunshine continued till the 31st, and the ship was unable to move; on the 25th a shade temperature of 43° was recorded at noon, a high figure in the pack ice.

Four days of rather unsettled weather followed; on the 31st drizzle and snow on a light north-east wind, backing to north-west and clearing; on August 1 rain and later snow, fresh north-east wind; snow fell again all morning on the 2nd on a decreasing north-east wind; the 3rd was calm and cloudy, slight rain in the afternoon, fine and clear over the land. Pressure during these four days was high over Greenland, with slight changes at the ship with an amplitude of about 4 mb., suggesting the passage of slight secondaries following a depression which had persisted for several days south-east of Spitsbergen.

In review it would appear that weather conditions in the ice were not exceptional. A line of investigation which might prove of interest, however, would be to determine the circumstances of origin of lows in the region between Greenland and Spitsbergen, such as those which appear to have affected the ship on the 21st–22nd and during the last few days of the passage.

Weather in the Fjords

The expedition was in the fjords from August 4–25, and at times there were three stations from which observations are available, namely, the land party, the ship, and the Norwegian station at Mackenzie Bay. The 5th and 6th were fine days, during which the ship sailed up Franz Josef Fjord. Pressure was rising over the interior. From the 7th onwards there were two parties, one working inland while the ship cruised in the fjords.

The ship reported a cloudy day on the 7th, with light wind; clearing on the 8th; fair with increasing cloud and backing wind on the 9th; fair again at first, deteriorating to a cloudy afternoon, on the 10th. Light easterly breezes prevailed until a feeble west wind set in on the evening of the 10th. The 11th was calm, with low cloud and occasional light rain, clearing to a fair evening, followed by two days' fair or fine weather, with light north wind and some Cu. or Cu. St. On the 13th the humidity decreased, with a fresh wind blowing down the fjords. The 14th was similar, with increasing cloud in the afternoon near the coast; rain was reported from Mackenzie Bay. Weather improved on the 15th, with less cloud and light north wind. Throughout this period reports from Mackenzie Bay show broadly similar conditions.

Pressure after a rise to the 6th fell generally to the morning of the 9th, and again to the morning of the 11th by about 10 mb. in all, rising then by a similar amount to the 14th. The charts show a shallow low-pressure area spreading over the whole Greenland Sea on the 10th, moving eastward. There is some reason to believe that the general precipitation on the 11th was due to a small associated disturbance; it is noteworthy that the first fall of pressure was not accompanied by precipitation. Pressure fell again over the fjords during the 14th–15th, and the Greenland Sea was occupied by a large shallow low during the 15th–16th.

The evening of the 15th also saw the climbing party experiencing a gale from north-west on the summit of Petermann Peak. The ship in Geology Fjord reported calm air but rough water the same evening, and "a strong wind" on the morning of the 16th, decreasing and falling calm by evening, accompanied by a rising barometer and very low humidity. Mackenzie Bay sent no reports during this day, and the weather charts indicate increasing northerly wind at Jan Mayen, with an elongated low-pressure area extending northward. The 17th and 18th are reported as fine, cloudless and calm over the fjords, with the barometer falling decidedly by 12 mb. both at the ship and at Mackenzie Bay.

A notable feature of the ship's reports during these days in the inner Franz Josef Fjord is the low humidity; the wet-bulb temperature averaging 40°, the dry-bulb ranging (at the ship) from 46° to 52°, corresponding to a relative humidity from 60 per cent. down to 20 per cent. Throughout the 16th and 17th the dry bulb remained particularly high, between 48° and 52°; it should further be pointed out that this was out in the fjord, with the thermometer not many feet above the water.

The ship left the head of the fjord on the 20th, and reports of the weather are not so full after this date. Snow was reported on the night of the 19th–20th. The barometer rose generally, however, till the 24th, after its decline on the 17th–18th. Weather was mainly cloudy with moderate to fresh or strong winds during the 19th–23rd, with a good deal of low cloud, and snow on the 21st, 22nd, and 23rd, which on the 23rd lay down to the 1000-foot level. The 24th was fine in the outer fjords, with light south-east wind and steadily falling barometer. This was followed at about 4^h on the morning of the 25th by a heavy squall from north-north-west, followed by fine weather with a strong north-west wind all morning at Cape Franklin; Mackenzie Bay does not report this, and one is inclined to suspect some local effect. Pressure had been generally high through this period over Greenland, with a persistent low east off Iceland. This low had extended its rain area to Jan Mayen and beyond on the 22nd, and began to move away about the 25th. The 26th–28th were calm fine days in the pack, becoming foggy on the 29th, by which time the ship was very near the outer edge of the pack ice.

Weather in the Mountains

The mountain party left the ship in fine weather on August 6. On the morning of the 8th, at 6900 feet, progress was hindered by "a slight blizzard and mist, temp. 18° F." Later in the day a relaying party in the Riddar Valley reported hot fine weather with mist above. We may presume that this slight snowfall was associated with local cloud on the hills, *i.e.* the clearing weather reported from the ship. The morning temperature at the ship was 49°, humidity 55 per cent.

The 9th, "never very clear . . . a little snow and low mist at night." This was followed by more mist and drifting snow next morning. Later the weather improved to a fine clear afternoon; but at night snow began again, and about 2 inches fell during the night of the 10th–11th. On the 11th, "overcast after snow; a searching west wind," with a persistent cloud sheet about 8000 feet. In the afternoon it cleared rapidly after 4 p.m., and an hour later it was calm, with hot sunshine. This was appreciated as the type of weather expected after the experience of 1926.

Phot. R. C. Wakefield

Icebergs packing into Kjerulf Fjord: looking east from Riddar Valley

Phot. M. M. L. Parkinson

Antarctic Harbour, Davy Sound

Phot. R. C. Wakefield

Walrus Gat, Jan Mayen: bones of Greenland whale and remains of seventeenth century Dutch cookeries

Phot. M. M. L. Parkinson

Teufelsschloss (Devil's Castle), Franz Josef Fjord

The 12th was very fine in the mountains, with light winds; and the 13th and 14th were also fine. On the 12th a relaying party reported a strong wind at Outlook Col; but there seems nothing abnormal in this, the col being exposed and facing west. On the afternoon of the 13th some wind was experienced blowing down the Nordenskiöld Glacier. On the same day the ship was reporting moderate breezes down fjord and low humidities.

On the 15th the party climbed Petermann Peak; the day is reported as "sunny, not too settled, with a fair amount of wind." Some "beautiful opalescent clouds" suggest Ci. St., but their direction of movement is not mentioned. The barometer was falling. The party had climbed in the shelter of the ridge; near the summit (9650 feet) they met the gale from north-west. The temperature was 12° F., with cloud increasing. It is thought that the wind had risen rather rapidly: it blew strongly all night and only moderated gradually next day to a calm evening. The subsequent two days (17th–18th) were reported as perfect. "Glacier streams thawed in the day, freezing again at night." It may be noted that the temperature at the ship in Franz Josef Fjord was about 43° when that on the summit was 12°—a normal difference for the height. On the 15th–16th the ship's thermograph shows a steady rise of temperature all night, but its results, though interesting, do not appear sufficiently trustworthy for extended discussion, and unfortunately temperature observations in the mountains are comparatively few.

Conclusions

In 1929 the weather in the East Greenland fjords during August was considerably more unsettled than in 1926. The latter was a year of little ice, and it may be mentioned that the period spent on the coast included several weeks of fine weather, only interrupted by occasional coastal fog, and by one violent storm lasting three days, followed by a short period of unsettled weather with rain and light winds.

Last summer provided instead a series of alternations between spells of two or three days of fair or of unsettled weather. Some time must elapse before the conditions governing the climate of this region are known, especially those governing precipitation. It is noticeable that several problems of this nature are presented by last year's events; it will be interesting to discover if there is any relationship between precipitation and ice conditions, for example.

A further problem is, of course, that of the origin of the characteristic northerly storms of the East Greenland coast. A question of interest, as regards 1929, is whether the gale on Petermann Peak, followed by a day on which Mackenzie Bay did not report, indicates a storm on August 15–16 of short duration similar to that experienced at Sabine Island in 1926; but confirmation must await the publication of results from Mackenzie Bay.

The information provided by Danish and British synoptic charts regarding conditions in the Greenland Sea is unavoidably meagre; but the writer would like to put forward the suggestion that the peculiarly violent and sudden northerly gales which periodically sweep this coast are perhaps associated with the sudden advent of a gradient for north or north-west winds caused by a slight fall of pressure in the region between Spitsbergen and Greenland, with, at the same time, a depression centred near Jan Mayen. Under the circumstances

the lows which seem either to originate or to approach from the north off North-East Greenland have little effect (*cf.* above, July 31—August 3).

It is notable that ordinary lows spreading over the Greenland Sea from the south are not associated with these gales, but with comparatively moderate north to east winds and some precipitation, for example, during the period August 19–23 of last year. Farther south, at Scoresby Sound, easterly to north-easterly winds, due to the Icelandic lows, may be very strong. North of the Liverpool Coast it would appear from previous expeditions that the strongest winds are from north or north-west, and that they rise and fall quite suddenly. Their duration at Sabine Island varied from 4 to 103 hours, according to the German Expedition of 1869–70. The Germans experienced 31 storms of this character in 10 months, the criterion being a mean wind speed of over 55 miles an hour. Clavering and others seem to have experienced similar storms. It would appear that farther north, however, at Danmark Havn (76° 46′), their violence is not so great.

Other observers have remarked on the low humidity in the fjords. One example may be quoted from last year, taken after the gale on the mountains on the 15th–16th, namely: August 16, evening, Franz Josef Fjord. Dry bulb 52·0, wet 38·5; relative humidity 15 per cent.

Air temperatures recorded were similar to those noted by other parties. From the results obtained by the various expeditions the mean temperature at the head of Franz Josef Fjord during July–August may be estimated as from 7° to 10° above that on the coast, which for these two months is about 38°. This difference is similar to that noted in other parts of Greenland.

DISCUSSION

Before the paper the PRESIDENT (Col. Sir CHARLES CLOSE) said: Mr. Wordie, who is to address us to-night, is very well known to us as a Fellow of our Society and a member of the Council. He was with Shackleton in the Antarctic and has taken part in two expeditions to Spitsbergen. He has been two or three times to Jan Mayen and East Greenland, and to-night he is to describe an expedition to East Greenland, of which he was leader. That expedition left Aberdeen last summer, but, owing to unfortunate meteorological circumstances, was unable to spend a very long time on land; the party had, in fact, less than three weeks in which to do their work on the mainland. In that time they managed to do a very remarkable amount of work both exploratory and geological, and Mr. Wordie, with two companions, climbed for the first time what is believed to be the highest peak in Greenland. This Society had the pleasure of contributing a certain amount of money towards the expedition, and also lent some instruments, and we were very glad to help such an excellent exploratory party.

Mr. Wordie then read the paper printed above, and a discussion followed.

The PRESIDENT: As Mr. Wordie has said, we are pleased to see present Dr. Lauge Koch, the highest authority on Greenland, and we shall be glad if he will address us.

Dr. LAUGE KOCH: It is indeed a great honour and pleasure to me to be present here to-night at my friend Wordie's excellent lecture. Twice I have met Wordie and his companions in East Greenland, the first time in 1926, and the second time last summer, and on both occasions I was strongly impressed with the excellent spirit and companionship that characterized Wordie's expeditions.

I remember, when visiting Wordie in Cambridge after his first expedition to East Greenland in 1926, I reproached him that as to one of his results, perhaps the one which I then considered the most important, namely, the discovery of the extensive alpine country west of Franz Josef Fjord, he had been too modest. And I said to Wordie, "Even if you think yourself that your map of these regions, viz. Petermann Spitze, Gog, Magog, Shackleton Mountain and so on, is not quite satisfactory, it is of importance that the whole material should be published." However, Wordie did not take my advice. But he did another thing which was still better: he started a new expedition. During this expedition he not only mapped Petermann Spitze, but also climbed it, so that he was able to bring back a very detailed map in addition to geographical and geological results of the greatest significance. It is much to be admired that he reached so far in spite of the very short time which, owing to the unfavourable ice conditions, was at his disposal. In those days when Wordie and his companions were working their way towards the top of Petermann Spitze it was frequently blowing a gale down in the fjords, and on my ship we often discussed whether or not they would be able to reach the goal they had set out to accomplish. We were much pleased when afterwards we learned that they really did succeed.

There is hardly any doubt that the results which we have been told about to-night are the first steps towards a completely altered conception of the geography of East Greenland. Even now the boundary of the inland ice along the stretch from Scoresby Sound to Dronning Louise Land has to be moved far westward, and it would be of importance if Wordie would continue his valuable geographical and geological investigation of this country, so difficult of access and as yet practically unknown. I congratulate him on the results he has already arrived at, and hope he will soon return to complete his investigations, which have been so admirably begun.

Dr. W. F. WHITTARD: Mr. Wordie has dealt with the results we obtained in East Greenland last summer, and I should like to speak from another point of view—that of future research. While in the pack-ice we had an opportunity of studying the fauna of the surface waters of the sea. On one occasion I well remember a piece of polar ice surrounded by a swarm of brilliantly coloured shrimp-like animals. We caught some and placed them in a basin filled with sea-water, and they were all dead within one minute. This made us realize that when polar-ice melts it forms a stratum of fresh water, which rests upon the salt water, and is inhabited by animals quite distinct from those present in the salt water of the sea. Thus one has the anomaly of a freshwater fauna living in juxtaposition with a salt-water fauna. The animals comprising these two faunas and their relationships to one another need future investigation.

It has been mentioned that the icebergs which are so common in Franz Josef Fjord and Davy Sound do not find their way far out in the pack-ice. An explanation of this may be that running parallel to the east coast of Greenland there is an offshore submarine ridge, sufficient to prevent the large icebergs, which tower up to 250 feet above the water, from reaching the heart of the pack-ice. A bathymetrical survey of the coast might prove the existence of such an offshore ridge and throw light upon the possible tectonic origin of the east coast of Greenland. At the same time the survey might be extended into the fjords, where, from the few soundings that have been made, it is apparent that, like the smaller Norwegian fjords, they are shallow at their mouth and deepen considerably inland.

When Parkinson and I were occupying a fairly high position on a mountain-side to the south of Antarctic Harbour, we saw far to the north-north-west an impressive range of uncharted mountains. One pyramid in particular stood out above its fellows, and I think at the time we were both of the opinion that that pyramid

might well rival Petermann Peak as being the highest mountain within the Arctic Circle. Of course, there must have been a great deal of optical illusion over so great a distance, and the mountain may not have been as high as it then appeared, but it was evident that an expedition to this mountain range would at least be repaid with excellent geological and geographical results.

Mr. AUGUSTINE COURTAULD: I should like to reply very shortly for Mr. Wordie and members of the expedition to the words Dr. Lauge Koch has used with regard to us. Everybody is aware that he has done more work in Greenland than any man now living: he has mapped practically the whole of the north by himself, and I should like to say that we managed to show some slight indication of our respect for his work by naming the best peak we had to name after him; so that he and Shackleton are the two explorers whose names live on our map.

I think you all realize that this expedition was led in a very competent manner, as one would expect of Wordie. I personally should not have liked the job of finding the route to Petermann. It is all very well to toddle along in the rear and carry weights, but a very different thing to find the way. I do not think there is any other road except up the Nordenskiöld Glacier, and, had we taken this route, we should have seen nothing, walled in as it is by sheer cliffs.

Dr. T. G. LONGSTAFF: I am very glad to have an opportunity of congratulating the members of the expedition. Dr. Lauge Koch, the man who knows most about Greenland, spoke of the geography, so I need not do that, but I should like to dot a few *i*'s and cross one or two *t*'s in this story to-night. I think only mountaineers will realize what a very big job it was to get to this mountain. Actually rations should consist of about 2 lbs. a day, so they were on short rations and they cannot have been carrying less than about 50 lbs. per man. Mr. Wordie must have been very lucky in his team; they must have been a hard crowd. That sort of thing takes a lot of sticking, especially when one really never gets a good meal from start to finish. Every mountaineer will take off his hat to those who reached Petermann Peak. We have seen sufficient also from the map and from the photographs for any mountaineer to realize that Wordie has great mountain sense. It was not an easy route, but a very complicated one to work out, and the man who led the party and worked out the route deserves as good a team as Mr. Wordie had.

The PRESIDENT: We have all listened to an admirable account of an expedition which was well organized and very successful. Not only was it successful in carrying out exploratory work, as is instanced by the maps which were shown, but was most successful in climbing that peak which may still be reckoned the highest in Greenland. Mr. Wordie has described to us the colours of the rocks, and I hope that next time he goes he will have some means of producing photographs in colour. I hope also that his next expedition to Greenland will not be very long delayed. The organization which resulted in such an expedition is not easily arrived at, and you can imagine that to do so much work in not much more than a fortnight is a considerable feat of which very few people are capable, and much credit is due to the leader of the expedition for carrying out such an excellent piece of exploration.

As to the height of Petermann Peak, before coming to this lecture I consulted, as I always do, the admirable atlas of the Touring Club Italiana, and I saw that the peak was marked down as 2800 metres, which is roughly 9200 feet, which is not so very far wrong. I believe Mr. Wordie made it 9650 by a single trigonometrical observation. He cannot say exactly what the boiling-point came out at, and I think, as a rule, the less one has to do with boiling-points the better.

We are all much indebted to Mr. Wordie for the account he has given us, and congratulate him heartily on the success of his expedition.

EXPLORATIONS IN THE EASTERN KARAKORAM AND IN THE WESTERN KUNLUN: *A paper read at the Evening Meeting of the Society on 24 March 1930, by*

DR. EMIL TRINKLER

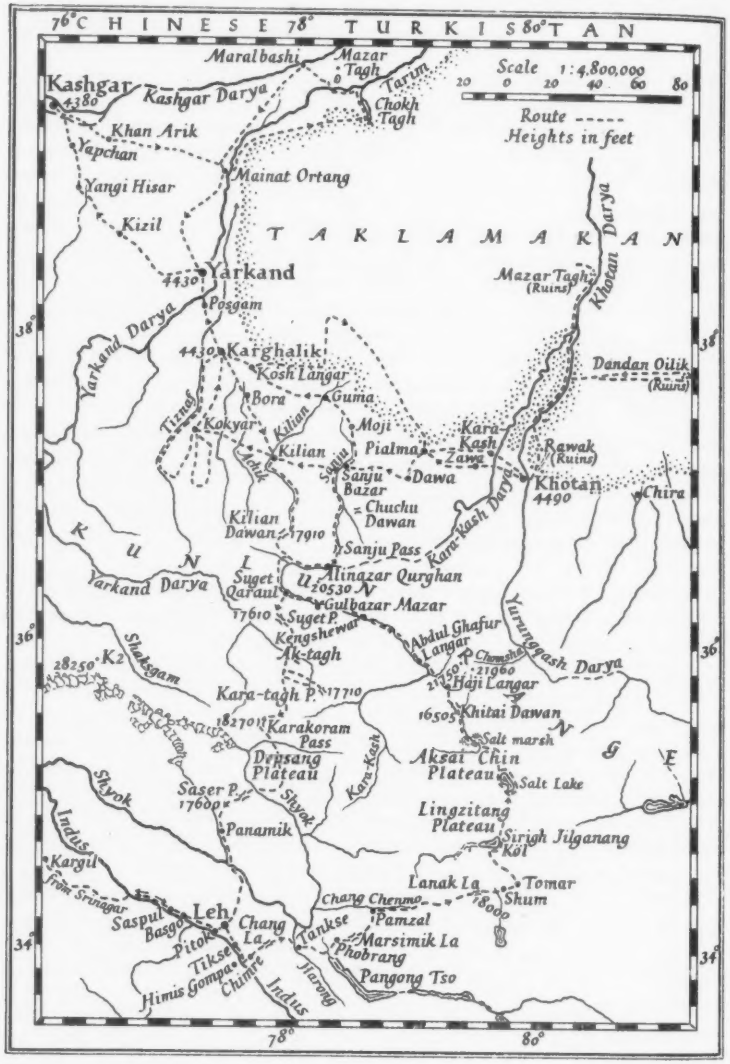
DURING the expedition I undertook in 1927–28 I twice crossed the high mountain ranges and plateaux separating the Upper Indus Valley of Ladakh from the Tarim Basin of Chinese Turkistan or Sinkiang. As my caravan traversed these regions on two different lines we had the chance of studying two different sections across those high mountain regions. This was very important for the geologist of my party, Dr. de Terra, who by a thorough study of the structure of the rocks and mountains got a good idea of the geological history of this part of the world. I myself made a plane-table survey covering the area from the Pangong lake across the high barren plateaux to the Upper Kara-Kash river. My main aim, however, was to obtain a good idea of what the Ice Age on those plateaux had been like.

When starting from Leh in July 1927 my plan was to go around the westernmost end of Pangong Tso to the barren plateaux of the western Tibetan borderland. These plateaux are called Lingzitang and Aksai Chin on the Indian Survey maps, but I never met any native who knew these names. After finishing our work there, I intended to start for Khotan in Chinese Turkistan by travelling through the Upper Keriya Darya district. If I speak here of the Lingzitang and Aksai Chin plateaux as belonging to Western Tibet it is only because of their geographical character, for politically these regions are in Kashmir.

As the part of Central Asia which I wanted to visit is absolutely uninhabited we had to take provisions with us for three months for ourselves, for our Indian servants, and for our coolies. So we started with a rather big caravan when leaving the last Ladakhi stone huts at Phobrang, north of the blue Pangong Tso. As I was well acquainted with the reports of explorers, and had studied all the travel reports dealing with these regions, I knew that sheep could be extremely valuable as transport animals. Captain Biddulph, who once crossed those high plateaux with only a sheep caravan, had practically no losses whatever, and it was probable that sheep could stand the hardships of such a journey at least much better than horses could do. The Tibetans also use sheep as transport animals, loading them with salt and wool. So, besides thirty-one yaks and our riding-ponies, I took seventy sheep.

I shall not say much here about the road leading from Leh to Phobrang, because it has been described fairly often before and it is well known. We crossed the Chang La, that high pass in the Ladakh range, on July 16. I was rather astonished to find, even at an altitude of 16,000–17,000 feet, carpets of beautiful flowers in the green short grass covering the valley at Zingral. This small grazing-ground is on the southern slopes of the Ladakh range, just below the Chang La. We did not meet with any snow and ice until we reached the top of the pass. The descent on the northern side was not very difficult. On July 17 we entered the small village of Tankse. Here I had the chance of studying thoroughly the big boulders lying amidst the gravel deposits of the

lower Harong valley. Several of these blocks had been studied already, in 1906 and 1911, by missionaries from Leh. Several of the inscriptions are in Tibetan, others in Soghdian characters. One of the Soghdian inscriptions



was partly read by Prof. F. W. K. Mueller of Berlin. He believes that the inscription dates from the ninth century and that it was written by Nestorian Christians. Among the other inscriptions which I discovered there was one

written in old Indian characters, *i.e.* Gupta. The text unfortunately is only a verse of a Buddhist Mahayana Sutra. My Swiss companion, Mr. Bosshard, took snapshots of all these inscriptions, and we hope that before long some of them will be read. Near Tankse also there is a small old monastery in whose gloomy rooms there are elaborate wall-paintings showing scenes I could not identify. The painting is absolutely unlike that in other monasteries of Ladakh. It is much more artistic and is somewhat like Persian miniature paintings. There are very remarkable wall-paintings, often over three hundred years old, in many monasteries in Ladakh, especially in Himis Gompa, Tikse, Pitok, and Chimre.

Two days after leaving Tankse we saw the Pangong Tso stretching before us. It is the most beautiful lake I have ever seen. Its elongated form reminds us of a Norwegian fiord, and the study of the geology and morphology of this region tells us that the origin of the Pangong valley is similar to that of the Norwegian fiords. Old beaches show that the lake formerly stood at a much higher level than to-day. At the western end of the lake the stratified clay deposits are covered by moraine material, evidently deposited on the former bottom of the lake by glaciers advancing down tributary valleys after a period of high water.

The last place where we met shepherds and villagers was at Phobrang. On August 3 we left this place with our big caravan. I think none of us anticipated that our sheep would eventually save our lives, and that only one yak would reach the distant border-post of Suget Qaraul on the Karakoram road. In order to reach the lower Chang Chenmo valley my caravan had to cross the Marsimik La, which was not so difficult as I had supposed it to be. On the banks of the Chang Chenmo there stretch the grazing-grounds of Pamzal, where we stopped for a few days to give our animals a good rest. After twice crossing the Chang Chenmo we reached the hot springs of Kiam and then entered the less-known country. Deasy and Rawling had been there, but we did not know very much about the detailed topography and morphology of this region. The colours of the landscape were beautiful. Especially remarkable were the deep red sandstone mountains, probably of Tertiary Age, the greenish crystalline schists and light red cliffs of Jurassic limestones.

On August 16 we crossed the Lanak La, my plan being to go as far as a spot called Shum on Deasy's map and to try to reach the Lingzitang by a direct route. We succeeded in going a little farther on, to a place near the Sumjiling Plain. Needless to say, all these places were uninhabited, but old fireplaces told us that now and then the Tibetan nomads or the *Changpas* visit even these distant places. The ascent to the Lingzitang could have been effected fairly easily, but the coolies preferred to take a short cut which in the end proved rather trying. The landscape in this region was really wonderful. From a high snow-covered range, whose peaks rise to 20,600 feet, there stretch broad glaciers like big white tongues into the longitudinal valley bordering the range on the west. The Tibetan type of glacier is unlike any other type of the surrounding regions. The big Karakoram glaciers in the west are bordered by extremely steep-sided mountains which are often so perpendicular that the snow cannot find any hold on the slopes. The mountains on the Tibetan Plateau, on the contrary, are rounded and denuded, and are often so buried under ice and snow that you can scarcely detect any rock in the upper part of the ranges.

Once having reached the Lingzitang plateau we had to wend our way for two days amongst red and green hills. We discovered two small lakes and camped on the shores of a large lake called Sirigh Jilganang Köl on the maps. This is a Turki name meaning "the lake of the yellow valley." Probably it was called this because the old beach-lines surrounding the lake are a yellowish colour. I have tried in vain to find any hint about this lake in travellers' books as well as in any reports, and I cannot trace where the name comes from. Probably one of the members of the Yarkand Mission or Johnson saw the lake from the distance, and when he asked one of the Turki followers about it, the man answered: "It is Sirigh Jilganang Köl," or "the lake of the yellow valley."

We stayed more than fifteen days on the shores of the lake, thoroughly examining the surroundings in every direction. Probably we should not have done so if our horses had not strayed there. Although we sent out coolies equipped with blankets and provisions to bring them in, they could not find them. One of the coolie parties even went back as far as Pamzal, but as there had already been falls of snow at the end of August the footprints of the animals were covered with snow. At this place also, unfortunately, the yaks began to die. At first we could not find out what was the matter. They were unwilling to move on at all, and stood where they were till they suddenly broke down. We dissected several of the dead bodies and found that their stomach walls were pierced by worms or leeches. But I do not believe that this alone was the cause of the collapse of our beasts of burden. I think the bad grazing-grounds also contributed to their collapse. It was absolutely impossible to cover large distances with these sick animals.

We spent two weeks on the shores of this blue lake, surveying the country around and devoting ourselves to our geological and geographical studies. Like all lakes on the Tibetan plateau, this Sirigh Jilganang Köl shows signs of shrinkage. Old beach-lines run along the shore, the lower beach consisting of clay deposits while the higher is represented by a rocky terrace. I believe that these high plateaux, which are at an altitude of about 17,000 feet, were probably covered by stagnant ice-masses and névé. We shall see later on that in the region to the west, in the Karakoram, there are big glacial trough-like valleys of really extraordinary dimensions.

The survey of the lake and its surroundings gave us quite a different idea of the shape of the lake from that shown on the map.

Our next goal was the Aksai Chin, or "White Desert of China," bordering the great valley running along the southern rim of the Kunlun Mountains. In order to reach the big salt lake, formerly visited by Sir Aurel Stein, Crosby, and Sven Hedin, I crossed the mountainous regions rising between the Aksai Chin and the Lingzitang, leaving Hedin's route of 1907 to the west and that of 1908 to the east. We could have crossed these barren mountains easily if our remaining yaks had been in good condition, but already when leaving the Sirigh Jilganang Köl several broke down and we had to shoot them. We had to bury some dispensable stuff here because the loads became too heavy for the remaining animals. The more the yaks died, the more our sheep had to carry; they really worked splendidly and they could even carry as much as 30 lbs. weight. The country we had to cross here was practically barren, so to our great disappointment we often did not find any grass or burtze-scrub for our yaks.

Great cirques in range south-east of the Shyok bend from ridge west of Phobrang

The Tibetan Plateau east of Phobrang

Rock terrace along the Chang Chenmo near Pamzal

Looking south into the Rimdi valley at its junction with the Chang Chenmo west of Pamzal

I think the main reason why sheep can stand the hardships of such a journey better than yaks is that sheep can nearly always get enough food while grazing during the march. They pick up small plants or some grass here and there, however scanty it be. But the yak generally needs a good rest for its meals, and if it really is grazing during the march, it will never get enough to be able to do without a good grazing-ground at the end of the day. So if a caravan does not meet with any good grass for two or three days the yaks are very much weakened. We could advance only slowly towards the north, often crossing mountain ranges rising up to 17,600 feet. When after a three days' march we found a fairly good camping-ground with abundant grass we stayed there for several days, hoping that with a good rest our yaks would recover.

The country we had traversed was very interesting from a geological point of view. The mountains here, consisting of Cretaceous and Tertiary rocks, were of a greenish-grey and dark red colour. I shall never forget the beautiful sunset I saw on an evening in September 1927. I had made for a white coral limestone cliff some 17,500 feet high. This rocky cliff was much farther from our camp than I had supposed it to be, and I only arrived there as the sun was setting. I then had an extremely good view across a country of marvellous grandeur and beauty in spite of the desolation around me. On the western horizon I saw in deep blue and violet tints the mighty rampart of the ice-clad giants of the Karakoram behind which the sun was setting, dyeing the skies with a deep saffron colour. Around me and below there stretched, like a rolling sea, the many-coloured mountains. Blue shadows were lying in the valleys and nullahs. As soon as the sunset was over the whole country, lying in deepest solitude and silence, was dipped in bluish tints. Then the moon rose, and its silver rays led me back to our lonely camping-ground.

Very often when I was quite alone amongst these high plateaux, surveying, sketching, or wandering about, I had the feeling of being no longer on our globe but on a far distant planet. What impressed me most on my expedition to Central Asia was the absolute silence and solitude of the uninhabited regions, be it on the westernmost Tibetan Plateau or in the great Taklamakan desert of Chinese Turkistan. We eventually got so accustomed to the deep silence that when we had to pitch our tents again near human settlements we could not sleep at first.

Several of the valleys in the mountainous region to the south of the Aksai Chin are really valley plains. I found that these big valleys run in quite a different direction from that shown on the maps. These valleys, filled with immense gravel deposits and sand, must once have contained great rivers. Valleys with a breadth of one mile and more contain only a tiny rivulet wending its way between the gravel and clay deposits. Valleys containing no water at all are also often found. Sometimes the country looks absolutely dried up. The valleys and the broad river-beds are entirely dry, the lakes are shrinking and their water has a bitter salty taste. The desiccation which set in after the Glacial Period has made the country what it now is.

The beautiful salt lake on the Aksai Chin, with its turquoise-blue colour, also everywhere shows signs of desiccation. The shore around this lake consists of salt-encrusted clay deposits, very often cracked into polygonal fields. On the

shores of the lake the ground is very muddy. Skeletons of wild donkeys and wild yaks, embedded in the mud, show that these animals did not succeed in getting out of the swampy ground. The white clay terraces bordering the lake in the south are dissected by innumerable corridor-like fissures and gullies with many tributary gullies joining them. At the end of one of these I discovered a real cemetery of antelopes and wild yaks. The whole ground was covered with the bones and horns of these animals which had been driven into this trap by wolves, who knew quite well that their prey could not escape, because the walls of the gullies were too steep to allow them to escape. Although the lake water was very bitter and salt we once saw many wild geese on its surface. On several spots just on the shore-line I discovered hundreds of small flies sitting on the moist muddy sand.

As our yaks had not recovered in spite of a long rest on the old grazing-grounds here as well as on the Aksai Chin, where we also had good grass, we now made for the Kara-Kash valley, where we soon hoped to meet Qirghiz people.

The weather in these regions was rather rough and cold. We had snowstorms in August, and the temperature during the night in September fell to 9° F. There is no question that the monsoon enters these distant regions. If we could carefully collect all data about the influence of the south-west monsoon we should be astonished to see how far the regions of Central Asia are effected by it. The same applies to the south-east monsoon blowing from the Chinese Sea into Eastern Tibet as far as longitude 90° E. But these regions of Central Asia, at least the Western Kunlun and the Westernmost Tibetan Plateau, also get rain during the winter months from depressions wandering from the west probably across Afghanistan and the Upper Oxus Valley into the heart of Asia.

Sometimes we saw beautiful cloud effects on the high plateaux. I remember one afternoon on the Aksai Chin when the rim of every small cumulus cloud was shining in beautiful rainbow colours.

On the southern shore of the Aksai Chin lake we left our big luggage behind us in a depot. Our next goal was the Khitai Dawan, whence we could reach the Upper Kara-Kash. Leaving Sir Aurel Stein's route of 1908 to the north, we crossed the brown mountains separating the Aksai Chin lake from the salt marshes in the west, which had been seen by Johnson in 1865.

Dr. de Terra's explorations in these regions prove that the big broad plain-like valley running along the main range of the Kunlun follows faults which separate geologically the old Kunlun system from the younger folded regions of the Tibetan Plateau. At several places white quartz veins crop out from the detritus of the valley bottom. Dr. de Terra could also follow this line of disjunction farther to the west. The Kunlun is one of the oldest mountain regions in Central Asia, whereas the ranges of the north-western Tibetan Plateau—on the Lingzitang and Aksai Chin—as well as the Karakoram, are as young as of Cretaceous and perhaps even Tertiary age.

The valley leading down from the Khitai Dawan shows traces of former glaciation. It is joined from the south by a broad valley plain which forms a kind of big hanging valley above the easternmost tributary valley of the Upper Kara-Kash River. In the upper part of this tributary, near Haji Langar, there are enormous moraine deposits consisting of granitic boulders. The crossing

of the Khitai Dawan (16,505 feet) was not very difficult, although a snowstorm was raging during the night before our start. Farther downstream I had the good luck to discover a small tributary valley giving access to the main Kunlun range. It would be extremely interesting to explore the upper part of this nullah, which might lead to a pass in the Kunlun range.

I also made a careful study of the Kara-Kash valley. Personally I believe that this big valley also was modelled by the action of the Ice Age glaciers, but unfortunately we have no direct means of proving this assumption. In such a dry continental region no striated boulders are preserved, and you can often only judge from the shape of the valley's trough and from the presence of old shoulders, which are frequently very faintly indicated, what was the former extension of the glaciers. Unfortunately, the lower part of the Kara-Kash river between Alinazar Qurghan and its exit from the Kunlun Mountains, for a length of some 40 miles, is absolutely unknown, and it is very likely that big terminal moraine deposits may be piled up there.

In the upper part of the Kara-Kash we saw wild yaks, big black beasts, as well as herds of antelope, but not a single wild donkey. I think that the wild donkeys only live on the high plateaux over 16,000 feet. The Qirghiz people had already left the upper grazing-grounds in the valleys. Only after crossing a side spur running down fron the Kunlun range did we meet a small Qirghiz settlement near Kengshewar. The good nomads were rather astonished when we approached their yurts. But as soon as they learned that we were peaceful travellers, the headman led us into his yurt, where he gave us milk, bread, and butter. He afterwards told us that they had been much astonished at seeing our party coming from the east, which was a no-man's land. They remembered quite well that some twenty years ago a sahib, who had had frozen feet, had come from that direction. So they had not forgotten Sir Aurel Stein's party, which passed this spot in 1908.

We stopped some days in the desolate, dirty, custom serail of Suget Qaraul on the Karakoram road. Here we were able to hire a camel caravan, which, led by two of our best and trustworthy Ladakhi coolies, was sent back to the Aksai Chin to fetch the luggage we had to leave behind. Needless to say, the owner of the camels had never heard the names of the Lingzitang, Aksai Chin, or Khitai Dawan. Afterwards our clever assistant caravan-bashi, Zabur Malek, who went with the camel caravan, told me that they had taken another direction after leaving the Upper Kara-Kash valley. They did not cross the Khitai Dawan as we had done, but passed round to the west and south of it. When coming down from the Khitai Dawan I had seen in the distance a blue sheet of water bordered by beach-lines. The camel caravan went along this lake, met with fresh-water springs, and reached the depot safely. So they did not have to cross the mountains lying between the Aksai Chin and the Khitai Dawan. The road they took seems to be a particularly easy one leading from the Upper Kara-Kash valley directly up on to the big plateaux. There are several smaller lakes in this part of the westernmost edge of the Aksai Chin. I think the only European who ever followed this road was Johnson, although it is often difficult to find one's way through his reports. Hayward in 1868, as well as members of the Yarkand Mission, followed the westernmost main branch of the Kara-Kash down to the junction of the eastern tributary valley.

When in October 1927 we went on from Suget Qaraul into Chinese Turkistan, we made for the Sanju pass, which, in spite of its mean height (16,500 feet), is much more difficult than any other pass we had to cross. I even think that the ill-famed Saser pass is not much more difficult. The Sanju pass has been crossed by many Europeans, and the topography of this region is now well known. Some geographical facts however might be summarized here. In the valley leading down from the pass to the foothill region of the Kunlun marks of former glacial action can be seen at several places. The big well-preserved boulder deposits which are situated in the upper part of the valley give an idea of the former extension of the glaciers. Unfortunately our ride down to Sanju Bazar was carried out in such a hurry, pressed upon us by the orderlies of the Chinese authorities, that we had not enough time to study properly the lower part of the valley. As the Sanju river had not too much water in it, we could follow the direct path leading through the big gorge which the river has cut through the mountains. In one day's march we had to cross the river more than twenty-five times. As soon as the summer floods, caused by the melting of the snows in the mountains, are coming nobody can traverse these gorges, and caravans have to cross the range by the Chuchu Dawan.

I spent the winter months of 1927–28 in the great Taklamakan Desert of Chinese Turkistan, engaged in geographical and archaeological studies. I shall not dwell on these subjects here. I paid a visit to the small deserts west of the Yarkand Darya, and I also visited the strange Mazar Tagh near Maralbashi. The hills which interested me most were the small ridges south of the Yarkand Darya. I found that their structure was rather complicated, and that they consisted of limestones, deep red quartzites, as well as younger volcanic rocks which had been intruded into red sandstone changing it into quartzite. The limestones which form steep cliffs in the Chokh Tagh are probably of Palaeozoic Age. Formerly it was generally believed that an unbroken range crossed the Western Taklamakan from these desert ranges directly to the Mazar Tagh on the Khotan Darya. But Sir Aurel Stein has proved that there is no connecting link between these desert hills, although he believes that formerly there probably was such a range, which has been destroyed by wind-erosion. But the geological structure of the Khotan Mazar Tagh, which consists of younger Tertiary rocks, points to a more independent range, the more so as the strike of the rocks deeper in the desert turns more east–west.

I studied some very remarkable landscapes in the southern part of the Taklamakan between the Yarkand and Keriya Darya. It is the land of withering rivers. Among high belts of sand-dunes you often meet with old river-beds bordered by rows of dead trees and tamarisks. Formerly the rivers coming down from the Kunlun Mountains penetrated farther into the desert. The Keriya Darya once joined the Tarim, and the Niya further east, which once watered the old settlement of Niya, now ends some 70 miles to the south of the ruins. The same applies to other rivers. These rivers often also submerged the southern border of the sea of sand during extraordinary floods. This is proved by extensive clay deposits which can often be traced deep into the heart of the desert. A section near the famous Rawak Stupa showed me that such an inundation had taken place here after the third–fifth centuries A.D., because

Glaciated range south-east of Tomar

Looking south from the Sirigh Jilganang lake over the old lake bed

Large salt lake on the Aksai Chin from southern shore: Kunlun in distance

The Sirigh Jilganang lake from the south: clay deposits in foreground

Old clay deposits of the Sirigh Jilganang lake

the corresponding culture deposits of pottery debris, Chinese coins, bones, and beads are buried below clay layers. These layers were deposited during an inundation by the Yurungqash Darya. The old dry bed of this river can still be seen some 4 miles to the east of the ruin. After that hi͡gh flood the river changed its bed, shifting it some 12 to 14 miles to the west.

When returning from Chinese Turkistan in July 1927 I crossed the Kunlun with Dr. de Terra by the Kilian Dawan, which is to the west of the Sanju pass, while Bosshard returned to Europe via Russia with the heavy luggage and our collections. The valley of the Kilian river everywhere, especially in its upper part, shows marks of former glacial action. The valley has a beautiful trough form, in places resembling our famous Alpine valleys. The river often runs in a deep gorge cut in black slates and metamorphic rocks. The valleys also to the south of the Kunlun, which we entered after crossing the Kilian Dawan, were bordered by well-preserved rock terraces, which must have been modelled by former glacial action.

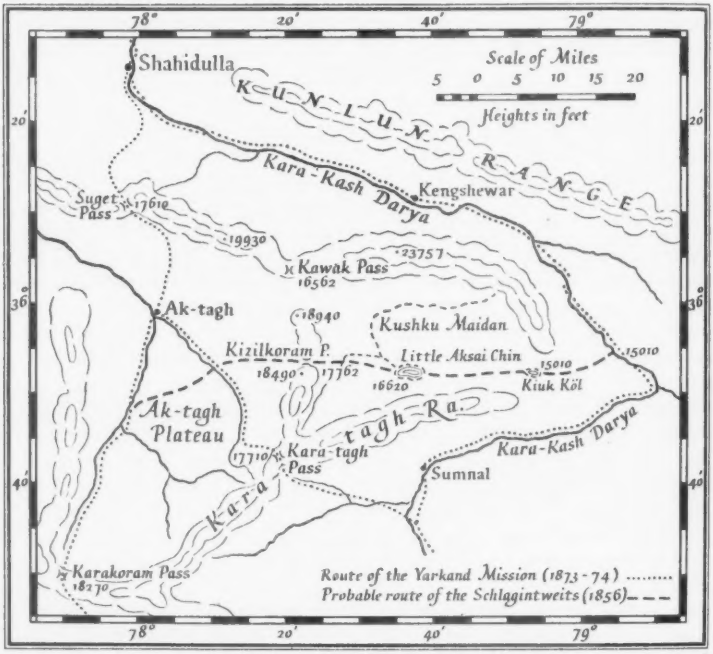
On July 22 we reached Suget Qaraul again, and from here we started for the Karakoram road. Although we generally followed the Karakoram road we were able to explore some hitherto largely unexplored regions north-west of the Karakoram range. I visited the plateau of Ak-tagh, and reconnoitred the region to the west of the Kara-tagh pass. Only Hayward and members of the Yarkand Mission have crossed this pass, which is situated in a range bordering the Upper Kara-Kash valley in the west, and which stretches east-north-east to west-south-west. The strike of the rocks in these regions is quite extraordinary because it is contrary to the strike of the main ranges. Our geological studies showed us that a younger folding has taken place in the sedimentary filling of Cretaceous and Tertiary rocks, and that the pressure was contrary to that which folded the Kunlun and the Karakoram ranges. I searched in vain for the lake which was seen by members of the Yarkand Mission when they went from the Kara-tagh pass to Ak-tagh. Probably the lake has dried up in the meantime. I believe that my countrymen, the Schlagintweits, were the first Europeans to cross the big plateau which is bordered in the north by the so-called Ak-tagh range, in the east by the Kara-tagh range, and in the south by the Karakoram. What they called the Little Aksai Chin is probably the Kushku Maidan of the maps of the Survey of India. It is still a puzzle to me what these explorers meant by the Kizilkoram pass, which is said to lie in a dark red range. I suppose this pass is to be found in a range which separates the Kushku Maidan from the plateau of Ak-tagh. The Schlagintweits mention that the Kizilkoram range branches from the Kara-tagh, the last name meaning the "Black Range." When I approached the Kara-tagh in September 1928 I had to climb a range consisting of red brecciated rocks, and this range perhaps finds its continuation in the north. The two lakes which the Schlagintweits mention, the Little Aksai Chin lake and the Kiuk Köll (the Blue Lake: Turki, Kök Köl), must be situated on the Kushku Maidan.

I have tried on the sketch-map overleaf to give an idea of the topography of those regions according to the descriptions which we find in the reports of the Schlagintweits. It is a pity that they have not published any detailed maps of their journeys. All we can do is to interpret their reports and to try to enter their observations on our maps. Their original diaries are stored in the

library at Munich, and I hope to examine them some day to see whether they contain any unpublished material.

I have not very much to say about the Karakoram road. In general I can confirm Prof. Dainelli's view about the former extensive glaciation of those regions. Big glacier streams once ran through the broad valleys of the Upper Indus district. We were held up in the Shyok valley for one day owing to the news that the ice-dam of the Chong Kumdun glacier, which had dammed up the Upper Shyok, was broken. But it was only a false alarm, and we could cross the river the next day safely by the ferry boat working there.

The rocks in this region are often deeply disintegrated. Boulders can be seen



Sketch-map showing probable route of the Schlagintweits, with names inserted from their reports

of which only the outer crust is left. Often the cavity was large enough to give shelter to our dog, who was always looking out for a shady place. Coming from the barren and high Karakoram regions we were much impressed by the beautiful Nubra Valley with its small picturesque villages. There are numerous small monasteries in the Nubra–Shyok Valley, and many of them are more or less unknown. I am sure that on old "mani" walls slabs of slate could be picked up bearing inscriptions which could tell us something about the ancient history of Baltistan and Ladakh.

After having spent more than eight months among the Turki population of

Peak 21,750, Kunlun, from ridge above Haji Langar

Kunlun from valley leading south from Peak 21,960 to salt marsh of the Aksai Chin

The upper Kara-Kash valley west of Abdul Ghafur Langar, and snow peaks of the Kunlun

Peak, probably 20,530 of Indian Survey Sheet 51 (Yarkand), in Kunlun north of Gulbazar Mazar

Looking up the Kara-Kash at great bend above Abdul Ghafur Langar

Chinese Turkistan we were rather glad to be back again in Ladakh. I personally like the Ladakhis more than the Turkis; they are always cheerful and always willing to work, they never or rarely complain, and they can stand the greatest hardships. The Turkis, on the other hand, are not so willing to work. Their struggle for life is not so hard, and they need not work so much in order to get their living.

On August 17 we were again in Leh, where we found the necessary rest after the long journey. Here I should like to mention an ancient monastery in Ladakh, which is situated at Basgo. In this monastery there are beautiful wall-paintings, and every traveller will be impressed by the huge statues of the Champa or Buddha Maitreya. Another spot worth seeing in the Upper Indus valley is Saspul, where there are beautiful old frescoes in small caves cut into the rocky cliffs. Several of these paintings are beautifully done, and the art-loving traveller should not miss a visit to these caves which are quite near to the bungalow.

On the last stage of our journey we were able to gather more observations about the morphology and geology of the country traversed. When one day the comprehensive scientific results of my expedition have been worked out and are properly published, I hope to be able to return to Central Asia to start special systematic investigations. There is an immense territory still to be explored, not so much from a topographical as from a geological and geographical point of view.

I should like, in closing, to express my deepest gratitude to the Government of India and to all the British officials who gave me so much help during my expedition.

DISCUSSION

Before the paper the PRESIDENT (Colonel Sir CHARLES CLOSE) said: To-night we are to listen to a lecture by Dr. Emil Trinkler, who is a Fellow of the Society and has often studied in our House. He is known to us for his journeys in Afghanistan and, more lately, for his researches and explorations in the Karakoram and Western Kunlun. He was accompanied on his journeys by Mr. Bosshard and Dr. De Terra, neither of whom, I regret to say, is with us this evening. Dr. Trinkler, you may remember, contributed a valuable paper on the Glaciation of the Tibetan Plateau in the recent March number of the *Geographical Journal*.

Dr. Trinkler then read the paper printed above, and a discussion followed.

The PRESIDENT: We are honoured to-night by the presence of H.E. the German Ambassador, who has kindly consented to say a few words.

H.E. THE GERMAN AMBASSADOR (Dr. FRIEDRICH STHAMER): I wish to thank you for the cordial reception which you gave my countryman, Dr. Trinkler, and for the great approval you showed of his lecture as well as for the interest with which you followed it. I venture to say that we were all very interested in what we have heard to-night and that we were highly impressed by the picture which Dr. Trinkler drew of those unknown regions, regions which emulate in grandeur and picturesqueness the Alps, which you probably all know, and regions which would be worth a visit if they were not so distant and if they afforded the comfort to which modern people are accustomed.

I wish also to express my thanks to the Royal Geographical Society for having invited Dr. Trinkler to come to London to lecture on his experiences. It is the privilege of the Society to hear lectures by explorers, scientists, and members of

geographical societies all over the world, because the character of this Society and its work is international and embraces the whole world. It is interested in the experiences of and explorations by any expert from any nation. I am especially glad to put on record that Dr. Trinkler is not the first German scientist to lecture on his experiences, but is one in the list of many German explorers who have visited London at the invitation of the Royal Geographical Society. I may mention Dr. Filchner and Mr. Rickmers, who, in turn, explored the same or contiguous regions as Dr. Trinkler, and who gave us an insight into the life and customs of the people of Central Asia.

I am glad that my countrymen have been the guests of the Royal Geographical Society, and I know that is a sign of the extremely good relations which exist between your Society and my country. I may refer also to the visit which was paid three years ago to the Geographical Society of Berlin on the occasion of its centenary, and I hope that members of this Society and of my country will take part in the centenary of the Royal Geographical Society which is to take place in London this year. I thank you very much for your attention.

Sir FRANCIS YOUNGHUSBAND: I think we should, in the first place, remember that the first Europeans to explore the region that has been described this evening were the two brothers Schlagintweits, countrymen of the lecturer. They were very remarkable men, and had in other parts of the Himalaya made some original surveys, and brought back some beautiful pictures which are now to be obtained in colour prints published during the 1850's. Probably the reason why the records of that part of their explorations which has been described this evening have apparently not been preserved is because one of them was murdered in Central Asia. He was the first European to cross the Karakoram Mountains into the plains of Turkistan, but he lost his life in Kashgar. As I say, they were two very remarkable men, and on an occasion such as this we ought to remember the services they rendered to geographical science.

I have not myself been to the eastern part of the region the lecturer described. I crossed the Karakoram Pass in the years 1889 and 1890, and I could see from it the kind of country which Dr. Trinkler traversed in the journey he has described this evening. Certainly a more desolate and depressing region you could hardly imagine. It is not only very bare but, being at the height of 16,000 to 18,000 feet, it seems more desolate, because you feel in a very depressed state of mind on account of the altitude. Nevertheless, as Dr. Trinkler has said, you do on special occasions find real beauty there. Such occasions are sunsets, when the light slanting across the mountains and valleys has the most marvellous effects both of colour and of light. It is well that a traveller like Dr. Trinkler has taken the trouble to describe such a scene to us.

Also what is remarkable in that mountainous region and, again, also in the desolate region of the Taklamakan, which Dr. Trinkler afterwards traversed, was the extraordinary stillness, especially at night when you get out under the stars. It is then that you feel the wonderful stillness and silence impressed upon you and producing an effect which it does not produce in anything like the same degree in Europe.

Dr. Trinkler went to that region especially to see what the Ice Age was like; and any one who has been in that part of the mountains can see the way that the ice covering there has moulded the mountains and broadened out the valleys. But what has often puzzled me is why in that region of the Karakoram and away to the east there are rounded mountains and great broad open valleys, and again in the Pamir region, away farther to the west and north, you see the same thing, and yet in the middle, between these two regions, round K_2, you find deep-cut valleys and steep hillsides. It is very difficult to understand why in that gap of about

200 miles there should be mountains and valleys of such a different type. I do not know that the explanation has yet been given.

There is a lot, as you can see from the maps, still to be done; and we hope that Dr. Trinkler will be going to that region again, as he has suggested this evening. One of the things that impressed me was the way in which he overcame his transport difficulties with the aid of sheep. I have had sheep in that region, but rather for supply purposes than for transport. Somehow or other sheep do manage to pick up food in those desolate regions, and after several weeks they are still quite good eating. Dr. Trinkler was, apparently, able to use them as useful transport animals for weeks and weeks together.

I should also like to agree with the lecturer in what he said with regard to the cheeriness of the Ladakhis as compared with the Turkis of Turkistan, the latter being a very amiable type of people, but not very cheerful or very willing to work hard. On the other hand, the Ladakhis, in my experience, have been cheerful and very delightful people to have with one. Any one who wants to know their character and habits of life and their customs cannot do better than read a most interesting and entertaining book by one of themselves, entitled 'The Servant of Sahibs.' That book is written by a caravan boy, Ghulan Rasal, who started with me in 1890 and who was afterwards with many Europeans and Americans and was persuaded by Mr. Barrett, an American with whom he travelled in those regions, to write his experiences. The book is written in a most wonderful pigeon-English, but is most entertaining. I recommend all travellers who are able to get it to read it because they will not only learn something of Ladakhis' ways and customs but also what the Europeans appear like in the eyes of the Ladakhis. That they will find in good strong colours.

The PRESIDENT: Dr. Trinkler tells me that there is still a brother of the two brothers Schlagintweits alive in Germany, and I understand it is his desire to try to find if there are not some records left amongst the family papers from which he could reconstruct some portions of their many journeys which are at present obscure. It would certainly be interesting and important for the study of that part of Central Asia if we could discover their diaries.

The lecturer is one of a number of distinguished explorers who have been to that part of Asia, and I feel that bit by bit we are getting to know something about it. We have had several lectures upon the subject, and Dr. Trinkler's is not the least important. We have had, for instance, a lecture recently by H.R.H. the Duke of Spoleto and an afternoon lecture by Colonel Schomberg on country a little farther north. I feel that one day we shall get a complete synthesis of that country based, I hope, on Dr. Trinkler's work, and on the labours of those other explorers whose names I have mentioned, and their predecessors.

It must not be supposed that it is possible to go into that country and start exploring without any previous study. You need to know, first of all, how to make a map; you need to be a bit of a geologist and to know some of the languages. To give you some idea of the sort of study necessary, I gathered from Dr. Trinkler that he began studying Tibetan when he was thirteen years of age. I think I am safe in saying that there are very few present who studied Tibetan at as early an age as that. Then you have to get accustomed to all sorts of strange food, and Dr. Trinkler tells me that the meat of wild donkeys is admirable: quite equal to English beef. I have not been able to make the comparison, but it must be admitted that explorers are sometimes very hungry.

We thank the lecturer sincerely for his lecture, and are glad that the Government of India was able to afford him facilities. The results have fully justified their action, and we shall look forward to Dr. Trinkler's detailed publications on the journeys that he has made.

NORTH-WESTERN MANCHURIA AND THE REINDEER-TUNGUS: *A paper read at the Evening Meeting of the Society on 7 April 1930, by*

MISS E. J. LINDGREN

BEFORE describing a recent journey to North-Western Manchuria in search of a little-known tribe of Reindeer-Tungus, I must review enough of the geographical and historical background of this region to explain how it could have remained so neglected. The Chinese Eastern Railway, passing through Hailar and Manchouli, appears to bring all the essentials for economic development to its very door; yet it has received less attention, I believe, than the remote provinces of Western China. The Chinese have named the northernmost part of Manchuria Heilungkiang, or "River of the Black Dragon," after the Amur, whose dark waters contrast strikingly with the muddy yellow of their own streams. The Amur and its great tributary, the Argun, must be indeed the central figures in any study of the country, forming a frontier of unusual significance, political, commercial, and ethnographic. Navigable for small steamers as far as Olochi on the Argun, these rivers have brought to life a series of little trading stations dotted at intervals along the border, saving it from the obscurity which shrouds the interior. On the eastern side of the Great Khingan Range the whole region is drained by tributaries of the Amur, principally the Nonni and the Kumara, and on the western by those of the Argun, of which the more important are the Bistraya, the Marekta, and the Gan. The area to which I confined my attention during this journey lies between the Argun on the west and north and the Khingan Range on the east, being bounded on the south by the Hailar. This river is considered by the Mongols as simply the upper course of the Argun,* and is so designated on certain maps.

The character of this region may be described as, roughly, of two types: that of the Mongolian plains in the south, and that of the Siberian taiga in the north. The forest belt approaches the bank of the Argun as the river and the line of the Khingan divide gradually converge, finally excluding the plains. From the valley of the Hailar to the Gan we find the dry, grass-covered, slightly rolling steppe which is the natural home of nomadic cattle-breeders such as the Solon and Chipchin who inhabit it. The triangular section of country drained by the Gan, the Derbul, and the Khaul has been named by the Russians the "Three Rivers" district, and is the richest in North-Western Manchuria. In its broad valleys agriculture flourishes, the hills afford excellent grazing for cattle, while timber is within easy reach on the thickly forested slopes of the Khingan to the east. Farther north the mountains begin to close in. If we follow the right bank of the Argun, however, we find the rolling foothills still quite barren as far as Shihwei, and they leave the river a wide bed in which to wander at leisure, forming many islands, often separating into two distinct arms, and sometimes doubling back upon itself. According to Bolotov,† between two settlements

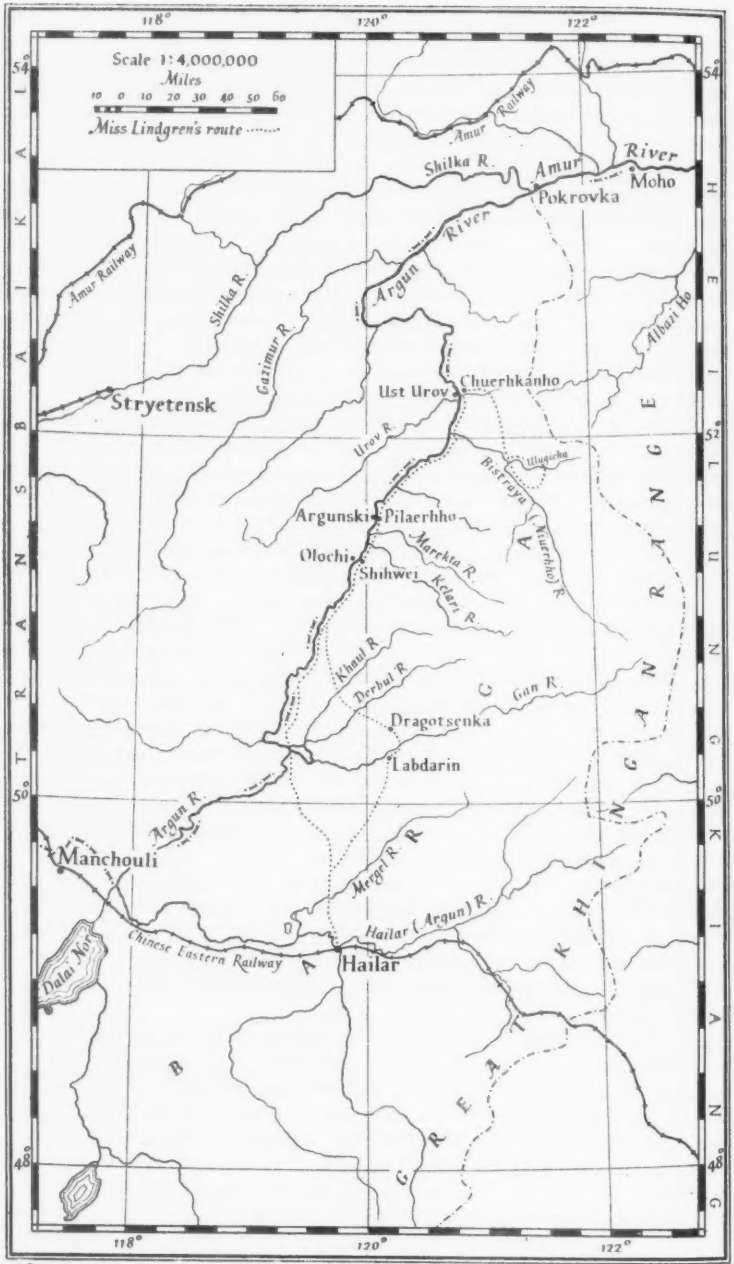
*Pronounced "Ergun" by Mongols, and believed by them to be derived from the root *ergi* (to twist, or turn around).

†'The Amur and Its Basin,' by A. A. Bolotov. Harbin, 1925. (In Russian.)

near the mouth of the Gan, Old and New Tsurukhaitui, which are only 15 miles apart by road, the course of the river covers 40 miles. The many tales of dramatic border incidents which form the staple topic of conversation in the inns along the road aroused my curiosity as to how the ownership of the numerous islands, some of them very large, had been determined. The ready answer was that a given island belonged to the country on whose side the adjacent bank first began to rise above the level of the river valley. This mode of definition, even if it existed only in the minds of the local inhabitants—and I have not confirmed it by searching through the old Russo-Chinese treaties—suggested wide vistas of varying interpretations, and all that they would imply. In practice, no doubt, "Might is Right," and he who chooses to pasture his cattle in mid-stream must have a watchful eye.

Beyond Shihwei the wooded foothills are in sight; a few miles north of Argunski they fall steeply into the river itself, and the whole region assumes the character of the Siberian taiga with its typical birch, larch, and pine. The carriage road gives place to random tracks that lead from the narrow marshy valley of one deep swift stream over precipitous rises to another. Indeed, from this point onwards means of communication by land may be said to be closed to all but the pedestrian with his pack on his back or the traveller who can afford to risk his horse's legs at every turn, and of such there are not many. The right bank of the Argun is on the whole steeper than the left, and this district has remained too undeveloped to induce the Chinese river steamers to proceed beyond Moho on the Amur, while the Russians maintain a regular service for passengers and freight up to Olochi, using, at low water, great barges drawn by tugs. This is an innovation introduced just before the Revolution; still more recently a good carriage road has been extended to Ust Urov, and the settlements along the border are now connected by telephone. The small Chinese trading stations, however, must depend during the summer on occasional junks which proceed at a snail's pace on the journey upstream, covering the distance between Chuerhkanho and Shihwei in two weeks or more with unfavourable winds, against the two days of the river-steamer. Only during the winter, when travel by sledge over the frozen Argun becomes possible, do the scattered outposts come within reach of each other. A letter posted in Hailar is received in Chuerhkanho in anything from one to six months, and it is a tribute to the postal service that it arrives at all. North of Chuerhkanho these conditions are intensified; the banks of the Argun become steeper, the settlements more insignificant and farther apart, until the Shilka flows in at Pokrovka to form the broad Amur.

In order to understand how the sparse population, whether native or immigrant, has come to be what it is, we must review the salient points in the history of the frontier. The Chinese annals give us some notion of a succession of peoples, variously identified by scholars as of Mongol, Turkish, or Tungus race, who have held sway at different times in Northern Manchuria. One of these, the Shihwei, have left their name to the little border town of to-day, and probably to several rivers and mountains; but such identifications are purely hypothetical. It was only with the Manchu conquest of China that this region began to present problems of imperial interest. The year 1644, which inaugurates the Manchu reign, marks also, curiously enough, the first appearance on

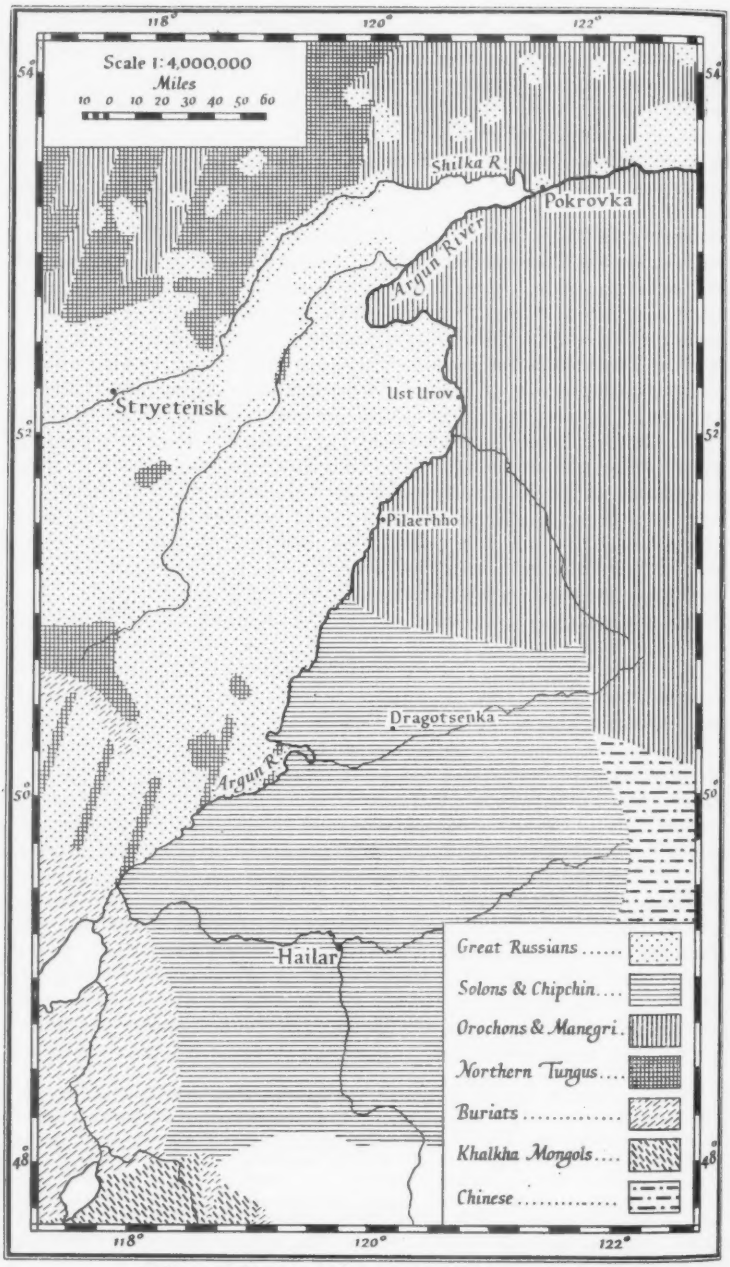


Sketch-map of Miss Lindgren's route through Barga, North-Western Manchuria

the Amur of Poyarkov and his Cossacks, who had come over the Yablonoi Range from Yakutsk. The Russians rapidly extended their influence throughout the region, founding Nerchinsk in 1654. By an able stroke of diplomacy, Gantimur, a Dagur prince whose territory stretched from Dauria in Transbaikal to the Nonni valley, was persuaded to declare himself in favour of Russian rather than Chinese suzerainty, and thus by 1675 they could claim to have pushed their boundary to the Khingan. When the Manchus had consolidated their power in China, however, they were strong enough to thrust the Russians back, and by the Treaty of Nerchinsk in 1689 the latter were forced to agree to the destruction of their fort at Albazin on the Amur. Russia never regained by treaty a right to any part of the present Heilungkiang, but since the Chinese never took an active interest in the colonization of the northern region, while Russian Transbaikal was growing apace, the border often existed more in theory than in practice. In 1732 the Manchu emperor ordered some hundreds of Solon, Chipchin, and Dagur soldiers from the Nonni to settle with their families in the southern part of Barga,* or Khulunbuir, as a permanent frontier guard. Barga, with its capital in Hailar, remained from that time a somewhat special area under the direct jurisdiction of Tsitsihar, and its local officials were often Mongol or Dagur. With them the atamans of the Cossack settlements were able to come to a good understanding with regard to border affairs, even without fostering their dream of an autonomous Mongol state of the future. In any case the whole northern forested part of the district attracted no attention at all from the Chinese side, and there the Russians reaped their wheat, cut and stacked their hay, hunted deer, squirrel and sable quite unmolested. At most a few enterprising Chinese traders established themselves on the right bank of the Argun opposite the prosperous Cossack settlements, with a small stock consisting chiefly of tobacco and spirits.

This was the situation until the Chinese Revolution was swiftly followed by the declaration of independence of Outer Mongolia, with which Barga associated itself. When the Chinese regained control in Barga they appointed their own officials for the local administration, and divided the whole territory into four districts, the two northernmost of which are Chuerhkan hsien, bounded by the Marekta, and Shihwei hsien, extending to the Gan. Some amusing incidents were bound to occur when the Chinese came to assert the all-important right to collect taxes on the land which the Cossack settlers on the left bank had long regarded as their own. In the case of Chuerhkanho, the new official and the ataman of Ust Urov on the opposite side of the Argun each insisted that the other should be the first to cross the river and present his credentials. The Chinese believe that they owe the final recognition of their claims to the stratagem of setting fire to the rich fields of Russian wheat sur-

*Barga, used as an administrative unit, includes the whole section of Heilungkiang west of the Khingan, although it belongs more properly to the southern plains previously inhabited by the Bargut Mongols, the extreme western part of which they still occupy. They are said by some Russian writers to have been called "Bargut," meaning "dark," "unenlightened," by the Mongols because they were the last to hold out against Lamaist Buddhism, clinging to their ancient shamanistic rites, some of which secretly survive among them to this day. But Pelliot has pointed out (in a personal communication) that their name is only a phonetic contraction of "Bayirkhu," a tribe mentioned in the Orkhon inscriptions.



Ethnographical sketch-map of the Argun basin

rounding the Chinese outpost. According to the Russian version, on the other hand, recognition only followed when due instructions to that effect were received from higher authority in Nerchinsk, and it is added that after the wheat-burning incident it was only with the greatest difficulty that the ataman restrained the hot-headed young men among the Cossacks from bloodshed. They would have asked for nothing better than an excuse for annihilating the handful of Chinese traders, rewarding themselves with the reserve stores of spirits, and wiping out many an inconvenient debt! From this time on, in any case, the Chinese population on the right bank began to increase, although very gradually. Apart from immigration, it had already recruited itself in a manner full of significance for present and future conditions along the frontier. From the first the Chinese traders had settled down with Russian wives, and to-day the growing second generation forms a considerable element in every community. The few Chinese women who brave the long and difficult journey to follow their husbands to these parts find the climate too severe; many die, while the others return as quickly as possible to their homes in Southern Manchuria or Shantung. Thus intermarriage with the Russians will no doubt continue indefinitely, and if the Eurasian type proves hardy enough to survive, the increase in population may gradually change the character of these lonely outposts and lead to economic development. Among the Chinese inhabitants we must include, besides the traders and the civil officials at the two administrative centres, the small garrisons of the guard stations, which coincide with the larger frontier settlements.

The Russian Revolution has indirectly supplied the Chinese with the most substantial element of the border population of to-day. The emigrants, many of whom have only crossed the river and settled within sight of their old homes, are largely of hardy Cossack stock and continue to live as farmers and hunters on land already familiar to them, as we have seen, for generations. The Three Rivers district has proved the most attractive, however, and has drawn the majority away from the frontier stations, where the Russians form only 35 per cent. of the population, against 90 per cent. of the 2000 or more distributed among twenty-two settlements in the Three Rivers district. But since it is the Russians, primarily, who raise the grain and carry on the trade in furs with the native tribes, the economic life of the region centres around them.

Between the small groups of Chinese and Russians scattered along the Argun and Amur, and the natives who fish and hunt in the depths of the taiga, there is little contact. There would, indeed, be none at all were it not for the taste they have acquired for tea, bread or millet, sweets, tobacco, flowered stuffs, trinkets, and above all spirits, and to obtain these they must offer valuable furs in exchange. But except for their periodic meetings with traders, they are never seen; for these hunters are all Tungus, and whoever has come to know them, in Siberia or Manchuria, has remarked their extreme shyness and distrust of the outside world. Even closely related tribes avoid each other.

Without raising the controversial question of whether the Tungus are a race with definite physical characteristics as well as a common language,* we may simply note that the hunting tribes of Northern Manchuria are known in

*See "On the Track of the Tungus," by M. A. Czaplicka, *Scottish Geographical Magazine*, vol. xxxiii, July 1917.

Russian ethnographic literature as Manegri and Oronchon,* and are held to belong to the Northern Tungus group, whereas the Manchu and Gold are classified as Southern. The Northern Tungus are supposed to have come originally from Transbaikal or Manchuria, and to have migrated to the north through pressure from the Mongols of Central Asia at the time of Chingiz Khan and earlier. The majority remain in the northern tundra to this day, scattered over a wide area; when and why a few tribes returned to Manchuria is uncertain. The Manegri, who are found on both banks of the Amur, on the right inhabit principally the valley of the Kumara, where there is sufficient meadow-land for them to pasture their horses. They show strong Chinese influence, and are regarded by the Reindeer-Tungus as having always occupied the territory where they live at present. Ethnographers believe, however, that they once possessed reindeer, and migrated here from the north, although their own traditions are not clear on these points. The Oronchon, on the other hand, who live close to the ridge of the Khingan, from the Chinese Eastern Railway to the sources of the Gan, still remember their reindeer, exterminated over a generation ago by a plague, and thus deserve their name, which means "possessing reindeer" and was given them by the Manchus. The Oronchon have also come under Chinese influence, modified by Mongol on the west, but neither they nor the Manegri have been sufficiently investigated for us to be able to assert what differentiates them from each other; their similarities are certainly very great.

There is a third group of Tungus hunters, inhabiting the forests north and north-east of Mergen on the Nonni River; they may prove to be essentially one with either of the above. They were visited recently by W. Stötzner, who made a large ethnographic collection on behalf of the Dresden State Museum of Zoology and Ethnography and took many photographs which should add greatly to our knowledge of their material culture. In a preliminary account of his findings,† Mr. Stötzner refers to the members of this tribe as "Solons," which may prove to be a misleading designation. The Solons of Barga, who regard themselves as a definite ethnic unit, are a strongly "mongolized" Tungus tribe living as nomadic cattle-breeders in the rich pasture-lands bordering on the forests east and south of Hailar. They were largely "evacuated" from the Nonni valley to Barga as part of the Manchu colonization policy, and they emphatically declare that none of them remain east of the Khingan at the present day, although some of their fellow-tribesmen have settled as far west as the Ili valley in Dzungaria.

But least known of all the Tungus hunting tribes in Manchuria is that inhabiting its north-western corner. Its members number less than two hundred and fifty, and they are undoubtedly dying out. But this tribe alone has kept its reindeer, and with them the typically Tungus cultural elements, material and social, which centre around these. Its migrations are almost entirely confined to the valleys of the Bistraya to the west, and the Albazi Ho to the east of the Khingan; the Manegri have prevented them from trespassing on what they

*Most authorities and maps spell Orochon or Orochen: the author, probably on etymological grounds, spells Oronchon.—Ed. *G.J.*

†"A Journey to the North-East of Mergen," by Walter Stötzner, *Proceedings* of the Manchurian Research Society, No. 7, December 1928. Harbin. (In Russian.)

regard as their territory, the Kumara valley, by burning off the reindeer moss at repeated intervals, fearing that their rival hunters would deplete the game. This isolated and interesting group appears to be most closely related to the Reindeer-Tungus of the Olekma River, occasionally treated as a distinct type in ethnographic literature. References in the Chinese records to the "shih-lu pu" ("tribe using reindeer") cannot be ascribed specifically to any one of the groups we have described, since they all may formerly have had reindeer; most probably the southern Oronchons are indicated. Nomenclature is even now a problem of great difficulty. Russians use the term Oronchon for the Reindeer-Tungus of the Olekma and of Manchuria, but also for the Khingan tribe which now uses horses; all the Northern Tungus appear to call themselves "avanki," a name which the Manchus also apply to them. The occupational classification of Reindeer-, Horse- and Dog-Tungus has been rightly objected to as "having no ethnographical significance,"* while that into Northern and Southern Tungus, as used by Schrenek and Shirokogorov, is partly a linguistic, partly a geographical one. It is still premature to suggest another, however, with the meagre material at our command. The Chinese of Barga refer to the Reindeer-Tungus as "ch'i-lin," a name obviously of foreign derivation, since it is written with different characters at different times, one pair of which has the plausible meaning "dwelling in the forest."

We find them referred to under this name in a report on the native tribes of Barga written in 1910 by a former Taoyin of Hailar,† and one of the spellings which he gives is written with the two characters signifying "unicorn"! This report contains an account of a trip undertaken by an official Commission to investigate the question of whether this tribe existed, and if so, where. The authorities at Tsitsihar contemplated conscripting all the Oronchon for the army, because of their reputation for unexcelled marksmanship, and had been much disturbed at the rumour that this semi-legendary tribe was trading with the Russians and considered itself subject to their government and not to the Chinese. Reaching Ust Urov, the members of the Commission turned to the Cossacks there and recorded all they could learn from that source; but they were so discouraged by the description they received of the hardships involved in entering the taiga at this point, that they went downstream to Pokrovka, which was at that time a trading station of some importance. There the Reindeer-Tungus living on opposite banks of the Argun often met, and when the Manchurian reindeer were decimated by a plague about thirty years ago, fresh stock was bought from the Siberian tribes; but all communication between them has since ceased, due to political conditions along the frontier.

In Pokrovka the Commission was able to obtain the services of one of the Russian traders as a guide and set out to find the Tungus. The Chinese found the swampy trackless forests very unpleasant, but struggled bravely on for two or three days, finally discovering two wigwams. The writer acknowledges that without the help of their guide, who managed to enter into conversation with one of the natives, their mission would have been fruitless, for the Tungus and

*See "The Reindeer and its Domestication," by B. Laufer, p. 120, *Memoirs* of the Am. Anthrop. Ass., vol. iv, No. 2.

†MS. in the possession of V. A. Kormazov, author of 'Barga: An Economic Sketch.' Harbin, 1928. (In Russian.)

their reindeer would certainly have disappeared into the taiga, leaving no trace. The Commission found the Tungus sullen, unresponsive to the solemn exhortations and proposals made to them on behalf of the Chinese Emperor, and finally quite stupid; they even contradicted themselves in giving the number and names of their elders, a matter which greatly interested the Chinese, desirous of obtaining some hold on them. The report concludes with the remark that they resembled dogs or horses, but had nothing in common with the race of men!

We suspect that both the Russians and the Tungus told the Commission rather less than they knew; but in any case the practical conclusion that it was fruitless to hope to enlist these shy hunters in the army was well founded enough. We learn from Mainov* that those Northern Tungus who began leaving the Yakutsk region for the Amur over a hundred years ago, did so to avoid paying taxes to the Russian Government, and because the more aggressive Yakuts were gradually encroaching on the territory which had previously belonged to the Tungus alone. Essentially a peaceful people, asking only to be left to wander undisturbed through the forests, they prefer to travel over hundreds of miles rather than be brought into closer contact with their neighbours, to say nothing of being forced into open conflict or permanent subjection. At present the Chinese district administration at Chuerhkanho contents itself with levying a tax of about £150 a year on the ten Cossack families who carry on trade with the Reindeer-Tungus in this region. The Russians meet the native hunters two or three times during the winter, at a stated time and place, bringing mainly flour, tea, and spirits to barter for their furs, which are chiefly squirrel since the sable was exterminated twenty years ago, thanks to the fabulous prices offered for its skin. During the summer the Tungus must come themselves to Chuerhkanho, or to the Chinese at Moho, for what they need; as a rule they visit the trading stations once in May or June, and again in August.

Although this tribe has never, to my knowledge, been the object of any detailed investigation, brief mention is made of it by Mrs. Shirokogorov† in the account of a journey which she made with her husband in 1915 from the Argun to the Amur. The expedition, after unsuccessfully attempting to visit the Oronchon of the Upper Gan, finally proceeded up the Marekta valley and crossed to the Upper Bistraya, where it encountered several families of Reindeer-Tungus. After remaining with them for twenty days, the travellers crossed the Khingan divide to the Kumara valley, where they found the Manegri. Most unfortunately S. M. Shirokogorov, an ethnographer who has published unique material on the Manchus, has never made more than passing reference to his observations among the Reindeer-Tungus and the Manegri. The abovementioned report gives a description of the condition of the roads and trails and a certain amount of topographical information, but in view of the hopeless inadequacy of the existing maps it is highly regrettable, as the authoress herself acknowledges, that this publication should be unaccompanied by a revised map. Had this sketch of the region been brought to my notice before I under-

*'Some Data concerning the Tungus of the Yakutsk Country,' by I. I. Mainov. Published by the East-Siberian Section of the Imp. Russ. Geogr. Soc., Irkutsk, 1898. (In Russian.)

†'North-Western Manchuria,' by E. N. Shirokorova. Vladivostok, 1919. (In Russian.)

Russian haymakers' shelter imitating Tungus wigwam

Dugout canoes of Northern Barga

Wicker house, Dragotsenka

The Upper Bistraya "125 miles from mouth"

Moose and wapiti ground on Upper Bistraya

Russian emigrants' settlement of Dragotsenka

The Ulugicha near its mouth

took my recent journey, however, considerable time and trouble would have been saved.

For it was with incomplete and largely misleading information about Northern Barga, its modes of communication, and where and how the Reindeer-Tungus were to be found, that I set out to investigate this remote tribe in June of last year. We were a party of three, supported by two stubborn Mongol ponies and two Russian horses, later increased to three. Mr. Oscar Mamen, a Norwegian, was not only the photographer, but, on the basis of twenty years' travelling and hunting in Mongolia, he accomplished the unenviable task of adapting a meagre equipment designed originally for the plains to the demands of three months' travel in swampy taiga. Haisan, who looked after the horses and helped about the camp, was a Dagur recommended by the Mongol yamen in Hailar, and came of a clan influential in the local administration. He spoke not only Dagur, Mongol, and Chinese, but also Solon, since his mother was of that people, and this enabled him to make himself understood by the Reindeer-Tungus, a very fortunate circumstance for us. I cannot pay too great a tribute to Haisan, his courage and his loyalty; he shared to the full our determination to reach the goal in spite of hardships, some of which were unfamiliar even to a Mongol. To my two companions is due the fact that the many practical difficulties which encumbered the way were successfully surmounted.

From Hailar to Shihwei the main road leads to the mouth of the Gan, north of which it follows the right bank of the Argun; another branches off beyond the Mergel river to Labdarin, and after crossing the Three Rivers district, passes through rough and hilly country before emerging at Shihwei. The former route is preferable in summer, because of the ferries over the Gan and the Derbul near their mouths; the latter in winter, when the rivers are firmly frozen and even motor cars belonging to the larger firms of fur dealers sometimes make the journey, reaching Shihwei the first day and Chuerhkanho the next. With cart and pack-horse the same distance can hardly be covered in less than two weeks. From Hailar to the Gan the unbroken rolling steppe is only relieved, at the end of each stage of four or five hours' riding, by the avaricious hospitality of a Chinese inn, so built that the well lies under the kitchen and every drop of the precious water, for man and beast, can be reckoned in on the bill. Scrub-willow, growing along the course of a rare miserable stream, supplies the only material for fencing and for the crude shelters thrown together beside the fields of an occasional agriculturist—for the large unkempt personnel of an inn can scarcely support itself on the few travellers who straggle through.

When we reached the Gan, however, the ferry was already working overtime, and a long line of carts stood waiting on both banks; for the river was rising, and two days later became impassable at this point even for horses, remaining so for the rest of the summer. On our return journey in September we were forced to take the upper road in order to cross the Derbul and Gan where they were somewhat narrower. This enabled me to see the Three Rivers district and several of the settlements which have grown up there overnight. In places where the forests are at some distance, as at Dragotsenka, the poorer families have built themselves ingenious "wicker houses," made by filling with earth the space between an outer and inner wall of neat willow-bough fencing. Another curious feature is an instance of the influence of the native tribes on the

The Uhgicha near its mouth

Russian emigrants' settlement of Dragotsenka

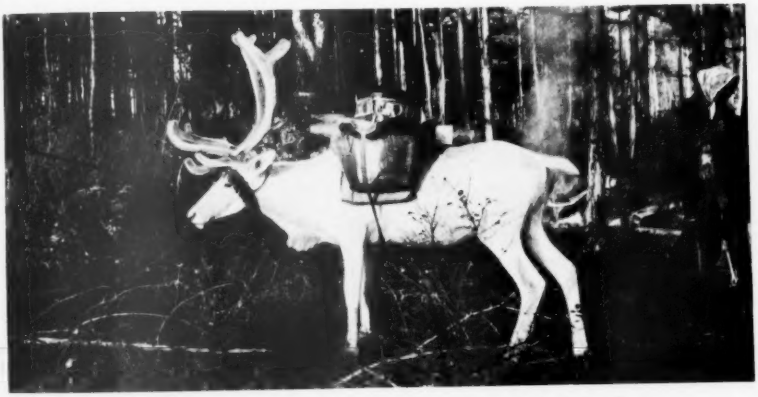
immigrants, a reversal of the usual order of things which is not infrequent among the Russian settlers in Transbaikal. The haymakers, who spend many days at some distance from their homes, have erected conical wigwams of poles and birch-bark like those of the Tungus, adding only a layer of hay. Caricatures and epigrams which I found inscribed on the bark wall inside one of these appeared to give vent to the feelings of some young party of haymakers who had been unwillingly confined within during this season when it rained two days out of three.

On our road north along the Argun, between the Gan and Shihwei, we received an early visit at camp one morning from an agitated Chinese traveller, who urged us to move on at once and refused even a friendly cup of tea, on the ground that we had spread our tent on the site of a murder. Pointing out a small mud hut on a strip of the Chinese bank that jutted out like a headland into the plain on the Russian side, due to a great curve in the Argun, he declared it to have belonged to two Chinese traders who, enjoying an evening stroll along the very bluff where we had camped, were surprised and killed by "bandits" from the other side. We could not feel very concerned about the injustice of their fate, since they would scarcely have chosen to live so far from any settlement had they not been at least dealers in contraband; and Haisan remarked laconically that as "lightning never strikes twice on the same spot," we had no reason to hurry our breakfast. Our informant left, disgusted with such lack of sensibility.

Shihwei lies opposite the Russian settlement Olochi, which is not only two or three times as large but acquires significance through being the terminal of the Amur river-steamer service. The Argun is here narrow enough for the voice to carry across without great difficulty, and some border incidents have been settled, and perhaps others caused, by this circumstance. When the villagers on the Russian bank all turn out to greet the incoming steamer, the event of the week, the envious onlookers on the Chinese side can hear the joking and laughing going on as provisions and merchandise are loaded onto the waiting carts. Some one starts humming a melancholy Slav melody which is taken up by others, soprano, alto, and bass falling almost instinctively into place, and soon these born choristers fill the valley of the lonely frontier river with the strange minor refrain. Shihwei is at present half deserted and predominantly Chinese, for the Russian emigrants who had ensconced themselves in primitive half-underground dwellings during the first years of the Revolution, thinking soon to return, have now moved on to the Three Rivers district.

Argunski represents the southernmost trading station to which the Reindeer-Tungus used to come, as it lies on the edge of the forest, which they are loath to leave even for a day. Opposite it on the Chinese side is Pilaerhho, and here we left our cart and most of the equipment with a Cossack family, packing the tent and some provisions on two horses, one of which belonged to a Russian hired as guide. We were constantly assured that the rains had rendered the country to the north, always considered closed for summer travel, quite impassable, and every one frankly expected to see us soon back again. The guide returned, it is true, within the week, for he did not relish the endless succession of streams swollen to roaring torrents by the rains, and we regretted only his horse, as we were forced to pack one of our mounts instead. Our mode of pro-

The hospitable Tungus family and wigwam



Reindeer loaded with flour and rolls of birch bark

Tungus woman baking bread

Tungus hunting equipment

Tungus cradle for strapping on reindeer

gression consisted in following the bank of the Argun until it fell so steeply into the river that we had to go back and take the hill at an angle, remaining on the heights for a few hundred yards before the next deep little valley brought us down again.

But the wild beauty of the scenery grew in proportion to the difficulties of the trail. From the hilltops wide vistas opened out against a background of darkly wooded mountains, and we had a bird's-eye view of the log-houses forming the isolated villages on the Russian side, some of which boasted a church. A low fence running continuously along the left bank of the river was obviously designed to keep horses and cattle from swimming across; but in spite of this precaution they are sometimes known to stray, and there is likely to be much shouting and vituperation echoing down the valley before they are restored to their anxious owners. The little groups of Chinese settled at rare intervals beside the Argun are chiefly gold-seekers, who busy themselves on the upper courses of the streams of this region, many of which are said to contain, like the Kelari above Shihwei, a small quantity of the precious dust.

The only serious obstacle in our way was the Bistraya river, whose name means "swift" in Russian and is richly deserved. The difficulty lies in the fact that the force of the river carried the long and narrow dug-out which is the only means of crossing two feet downstream for every one it makes towards the opposite bank, and the landing-place can easily be missed, while beyond it the river is lined with cliffs on either side. The terrified horses soon give up the struggle for air, and the task of holding their heads forcibly above water for so long a time is not without risk. The dug-out, locally called "bat," is highly precarious, and the Chinese, who have never acquired the skill of the Russians in manoeuvring it, frequently upset and sometimes drown. A "bat" made from two tree-trunks joined together down the middle is safer and more useful, but is rarely seen (*v.* right-hand canoe in photograph, Plate I).

We attempted to cross the Bistraya at a point 3 miles from the mouth, where a few Chinese have settled with their Russian wives, cultivating a small clearing in the forest. They suffer badly from the mosquitoes, which close in like a mist as soon as one leaves the bank of the Argun. As much of the farm work as possible is done in a dense smoke; and later, during our weeks in the taiga, we learned to eat and write up the day's notes standing directly over slow fires banked with grass, the horses crowding around for their share of the benefit. The elder of this little community unfortunately took offence because we refused to buy a horse which he offered us at a fabulous price, and forbade the young Eurasian who owned the only dug-out to take us across the Bistraya at this more favourable point. We were forced to proceed to the mouth of the river, where a cheerful one-eyed ferryman lived alone with a Russian half-wit, whom he kept as a sort of slave. After repeatedly warning us that we were swimming our horses at our own risk, he bound his two dug-outs together, and we crossed in safety, Haisan having taken the precaution of burning some incense to the Water God for the lives of our steeds. We were sorry to find the ferryman's white cat standing guard alone outside his disreputable little hut on our return, and later learned that a few days previously he had been murdered for his stores of flour.

Chuerhkanho lies opposite the Russian Ust Urov, and both are named after

Tungus cradle for strapping on reindeer

Tungus hunting equipment

the rivers that flow into the Argun beside them. Although about half of the emigrant population on the Chinese side has recently left for the Three Rivers district, those who remain give us a clear picture of the life of the Transbaikal Cossack peasant. The log-houses are solidly constructed, the steep roofs testifying to the heavy snowfall in this region; those of the richer settlers give an impression of comfort and cleanliness in the spacious rooms within. In the ample courtyard, as in the fields, the whole family is usually hard at work side by side with the maids and hired men, reaping wheat, mowing hay, or tending the horses and cattle. For household purposes they have comely vessels made out of birch-bark, which must first be boiled, an art they have learned from the native tribes of Siberia. Living in such isolation, the community must do everything for itself. There are frames for shaping wooden sledge-runners, for steel is too rare to be used for such a purpose. A device for crushing the bark of the larch, which is needed for tanning leather, consists of a wheel with iron cutters which is made by horse-power to revolve in a circular trough about a central pole. There is a variety of mills: two seen at Pilaerhho were joined to the bank only by a plank, and one of them was walled and roofed with birch-bark only.

If these Cossacks are hard-working farmers in the summer, turning their ingenuity to all forms of manual labour, in the autumn and winter they fall back on the more congenial companionship of a good rifle and turn to the chase. Moose, wapiti, roebuck, wild boar, bear, squirrel and occasionally a fox reward these enthusiastic hunters. But they never enter the taiga in the summer, fearing the endless marshes for their horses and heartily disliking the mosquito pest for themselves. It was with great difficulty that one of them was persuaded, at a high daily wage, to guide us into the forests, particularly as no one had an exact notion of where the Reindeer-Tungus were to be found. They usually move their camps at intervals of a few days, and when the Russians meet them in the winter it is always at a prearranged time and place.

We left with two pack-horses only, and thus carried a very restricted quantity of provisions, but we were assured that game was sufficiently plentiful for us to support ourselves with our rifles, while we could buy meat and flour from the natives, if we found them. Along the way we came upon traces of the Russian hunters in the shape of shelters ranging from a few bark-covered poles to a well-built cabin. One of these boasted a window consisting of two small pieces of glass fitted into a frame of two thicknesses of birch-bark, thus combining the virtues of good visibility and but little loss of warmth within. A high platform for storing food out of reach of dogs and wild animals was no doubt another lesson learned from the natives. After three days' march towards the east we emerged on the upper Bistraya, about 125 miles from its mouth. This river is misrepresented on all maps as shorter than the Marekta and lying north of the latter throughout its course; whereas all the hunters and natives of this region agree that it is at least 250 miles long and takes its source far to the south, within a few miles of that of the Gan.*

Although the Tungus pitch their wigwams beside the smaller streams, they come to the Bistraya to hunt, for the lagoons and inlets formed along its banks are a favourite haunt of duck and moose. Here the Tungus leave their birch-

*It seems impossible to modify Russian map to agree with these distances.—Ed. *G.J.*

bark canoes hidden in the grass each autumn, to be used again the following spring. Our guide knew where to find one, however, with its inventory of a double-bladed paddle, two yard-long sticks with which they pole upstream in the shallow water near the banks, and two small paddles which he assured us they manipulate with such skill that they can slip through the low shrubbery along the edge of a lake without a sound and surprise the moose taking a long drink at twilight. The canoes, like all the products of their material culture, are beautifully made: three large pieces of bark form the bottom, the upper edges are bound with slats of willow wood, which are also placed at intervals along the bottom, and joined to the bark with supple willow boughs.

We turned up the valley of a right-hand tributary of the Bistraya, the Ulugicha,* in the hope of finding some trace of the natives along one of the innumerable little streams that flow into it from either side. Mounting one swampy valley and crossing over a few miles of trackless hills only to descend the next, we were struck not only by the lack of any indications of human habitation, but by the absence of all traces of game, except for the bared roots and scratched tree-trunks left by wild boar and bear. On the eighth day our zeal was finally rewarded; but it cannot be said that we "found" the natives. This is indeed impossible unless, on first scenting intruders, their own curiosity overcomes their fear. In this case it was our good fortune that perhaps the most enterprising member of the tribe, while on the trail of a bear, saw the smoke from our fire, and approaching nearer gave the halloo which is a sort of password between the natives and the Russians who trade with them. Our guide answered, and the Tungus finally ventured across the Ulugicha to our camp. Although he examined us warily at first, asking the Russian whether we were really "nice people," he was gradually reassured by our cordiality, and after we had shared with him what meat we had and a drink of vodka, he consented to our visiting his wigwam on the following day. The first sight of a herd of reindeer among the birch and evergreens and the hospitable reception given us by the Tungus amply rewarded us for our journey; and Haisan was fascinated by these "tame deer" in whose very existence he had frankly disbelieved. It was not long before we had succeeded in pitching our tent beside a camp of four wigwams, and were thus able to learn something of the life of the natives.

At first glance the ready-made cotton clothing which they have adopted for summer wear, and the fact that all adults speak Russian, convey the disappointing impression that they must have lost all that once distinguished them as Tungus. But when we see the hunter setting out for the chase with rifle and pack, flourishing his "palma," a long knife used to cut down branches in the path, the real Tungus emerges. Both the palma and a shorter sheath-knife have a finely tempered edge of which their smiths are justly proud, and are bought at good prices by the Russians and Chinese. The natives have retained their own footwear and winter dress of deer-skin chamois, cut according to a pattern characteristic of Northern Tungus tribes. The women do almost all the work

*This river flows into the Bistraya about 160 miles from its mouth (see footnote opposite.—Ed. *G.J.*) at the point where the latter turns sharply to the west, its upper course lying almost due south. The Ulugicha is probably the largest tributary of the Bistraya, but the river of approximately this size and position which is indicated on Russian maps is there called "Ildigicha." This, however, is the name of a small right-hand tributary of the Apa or Chuerhkanho.

about the camp, tending the reindeer, preparing the food, making the decorative birch-bark and chamois boxes, bags and vessels which they use. Theirs is also the tedious task of boiling and sewing together the broad bands of alternating white and brown birch-bark which cover the wigwam in summer, but which are replaced by strips of chamois in winter. Bread is baked without yeast on an iron plate, and during the eighty or more years of close contact with the Russians in this region they have come to consider it as a necessary complement to their diet, while their great-grandparents were content with meat and fish alone.

During the day the reindeer usually linger about the camp, and the click of the little hooves attached to their salt-bags is enough to bring them running to the wigwam when they are wanted. They are milked three times a day, and the milk, while small in quantity, is delicious and as thick as cream. During the night the reindeer roam as far as 5 miles from the camp in search of food, eating not only reindeer moss but the leaves of young birch and aspen and various small green plants as well. When the camp is to be moved, the men go in advance to cut the poles for the new wigwams and start the fires, blazing the trail for the women, who are left behind to do all the packing, loading, and guiding of the reindeer, which in the case of a large herd is no easy task. During the summer, when the reindeer are maddened by the mosquitoes, the Tungus travel only at dusk, and in order that the reindeer shall stand quietly enough to be loaded, they must be tied in small groups beside the fires which are always kept burning about the camp for their protection. A heavy smoke is made by heaping on a variety of *Ledum palustre*,* which gives out a strong pungent odour; and the Tungus never fail to cleanse of evil influences any object bought from the Russians or Chinese by holding it in this smoke. The plant is also used to rub on the bleeding antlers of the reindeer when the diseased parts eaten by the mosquitoes have been scraped away with a knife.

The reindeer are loaded in a simple and expeditious manner. The packs are always arranged in a row beside the wigwam, ready for moving at a moment's notice; each consists of a deer-skin saddle-cloth, two skin-covered birch-bark vessels filled with flour which hang on either side, a saddle, and a box or two. In addition the long birch-bark bands are taken off the wigwam, neatly rolled and placed on top of the pack; the skeleton of poles being left to be used again by themselves or others. The baby's cradle, which keeps the child in a permanent sitting posture, is a great convenience to the mother, since it can be loaded on the reindeer and balanced against an equal weight on the other side, then covered over with a cloth as a protection against the rain; after which the most heart-rending screams from within receive no response, for the parents know that there is no danger. During a cold winter's march a Tungus mother is said to have reassured a Russian, who thought this practice barbarous: "Don't worry; baby is only warming himself"!

Occupied as I was with the study of such an attractive, if shy and uncommunicative, tribe, photographing types, recording their language, and attempting to reconstruct the elements of an older social organization which they have already all but lost, I would have liked to remain with them indefinitely, and

*A specimen of this plant was identified by Mr. Gilbert Carter, of the Botany School, Cambridge.

with this my two companions were in complete accord. One unhappy young bachelor had made friends with Haisan, begging him to inquire into the possibilities of obtaining a Mongol wife from the south, as there was a shortage of girls in the tribe, and the only appropriate match had been carried off by a handsomer rival the year before. But luck was against us. Not only did we find no game ourselves, although the two experienced hunters of the party searched diligently in the surrounding country, but we learned from the Tungus that they themselves had been without meat for two months, and that the death of several children and the illness of some of the women were to be attributed to the unrelieved diet of flour, while the men were obviously listless and despairing. Apparently the almost unprecedented floods had frightened the game, which the natives imagined to have migrated to the east of the Khingan.

With every little stream swollen to overflowing, attempts at fishing were largely unproductive also. Although some of them still possessed reserves of flour, others were facing starvation, for they did not know when they could get more. The journey to Chuerhkanho could not be undertaken until the Ulugicha became fordable again, for the reindeer cannot swim when they are loaded. Hospitable by nature, the Tungus generously shared with us the first roebuck they had killed that summer, and our supplies were so reduced that we could not refuse. When our own provisions finally came to an end, we felt that to continue depending for our subsistence on being daily guests in their wigwams, where etiquette forced them to offer us large portions of bread with our tea and reindeer-milk, was nothing short of criminal.

Still unreconciled to turning my back on this tribe which we had come so far to find, I decided to attempt to buy enough flour to take us to the sources of the Bistraya, in the hope of finding another group of wigwams said to be encamped there. From them we could no doubt obtain more flour, finally regaining the Argun through the valley of the Marekta or the Gan. But when this plan was exposed to our Russian guide, who had long had quite enough of ethnography, mosquitoes, and a rapidly diminishing food supply, he was thrown into a panic. Failing to dissuade us, he provided himself with some bread from a Tungus who stood deeply in his debt, and fearing to make the return journey through the taiga to Chuerhkanho alone, he forbade the others to sell us any flour, on pain of reprisals when they next came to the trading station if they disobeyed.

The Tungus refused all our offers, although it was plain that they felt very awkward about the situation in which they placed us; but the economic hold of the Russian traders is absolute since the natives have become dependent on them for flour, tobacco, tea and spirits. Our suspicions of our guide's treachery were confirmed through Haisan, who could talk with the Tungus without being understood by the Russian; but this knowledge did not help us to find a solution. In fact, we were forced to share the small supply of bread he had reserved for himself on the way back, as an alternative to eating nothing at all. Beggars are not choosers; delay was no longer possible, and at the end of five hungry marches, relieved only by a few capercailzies shot along the road, we were overjoyed to come upon a gay company of Cossack haymakers from Chuerhkanho who had camped in a forest clearing. They greeted us most warmly, saying that they had never expected to see us alive again. They laid down their work, the

women soon had the kettle boiling for tea, and all stood about asking questions and smiling indulgently while we devoured the bread, cream, and salted mushrooms which they heaped before us.

We left the Tungus with real regret, and they in turn appeared to be sincere in urging us to return. They were most anxious for copies of their photographs, which I trust have since reached them safely through the trading station. Although I believe that with the material I have collected it will be possible to classify them in relation to other Tungus tribes, when we have the corresponding data, there is still much left to do. With such pleasant and interesting memories I cannot but hope that, with better equipment, adequate provisions, and reasonable good luck, a second journey to North-Western Manchuria at some future time may prove even more fruitful than the first.

DISCUSSION

Before the paper the President (Sir CHARLES CLOSE) said: To-night we originally had fixed a lecture by Major Hingston on the subject of the Oxford Expedition to British Guiana, but we were fortunate enough to catch—if the expression may be excused—Miss Lindgren on her way from England, and we persuaded her to give us a lecture on North-Western Manchuria. I mention this rather carefully for fear there should be any in the audience who accept all the information which Miss Lindgren will give us and apply it to British Guiana. Miss Lindgren is a very distinguished scholar. She has travelled widely in China and Manchuria, and is going to describe a corner of North-Western Manchuria which has very rarely been visited by any Western Europeans. She has great advantages in that she understands and speaks Russian, Pekinese, and Mongol, acquirements which personally I do not possess. She has made full use of those advantages. She went out primarily as an anthropologist and ethnographer, but it is quite impossible to be a good anthropologist without being a geographer. So, as we know that Miss Lindgren is a very good anthropologist, we also know that she is a good geographer, and I ask her now to begin her lecture.

Miss Lindgren then read the paper printed above, and a discussion followed.

Sir HAROLD PARLETT: The lecturer has visited a part of Manchuria with which I am not familiar, but there are one or two questions I would like to ask her. Miss Lindgren mentioned the intermarriage of the Chinese with Russian women and the possibility of solving in that way, to a certain extent, the question of the population. We have heard a great deal of recent years of Chinese emigration into Manchuria, and they are gradually settling that part. Can Miss Lindgren tell us anything about their appearance in the particular region in which she journeyed? Did she notice any Chinese infiltration at all; and what conclusions did she come to with regard to intermarriage between the two races? Is the result at all good? Is the Eurasian an energetic person? Is he likely to help really to colonize that part of Manchuria?

Miss LINDGREN: As far as infiltration is concerned, it affects far more of the region to the east and south of where I was, along the Nonni river valley; the Chinese have been coming into Manchuria in millions since the Japanese created relative peace in the southern part of the country. There is now a Board of Emigration in Mukden concerning itself with the region near the Khingan, about where the Chinese Eastern Railway crosses the range. The work of that Board can only be termed very enterprising; it is trying to bring about the clearance of forests and swamps, but all considerably south of the part I visited. I do not

think in the region I have described there will be any colonization to speak of for a long time to come. Colonization must follow the large rivers such as the Nonni; none of the rivers in the region I have visited are really suitable.

As for the Eurasian type, it is perhaps a rather difficult and delicate subject. Those one sees are, of course, all bilingual. They speak Russian and Chinese equally badly, because their parents are not very educated. I doubt whether they would be able to take up the sort of life which the Cossack lives, that of hunter and farmer, under the very severe conditions of that region. On the other hand, I believe they could undoubtedly carry on quite well the occupation of the Chinese, namely, trading by boat and keeping little shops in the settlements. It is perhaps too early to judge of the type as such, because one of the factors will be their physical resistance to the climate, which, as I say, the Chinese as well as the Japanese women, cannot stand.

Sir HAROLD PARLETT: I take it that from your experience, Miss Lindgren, so far as colonization goes, this country is at present practically in the possession of a few nomad tribes who must eventually disappear and the country become colonized; and that of the two races, Chinese and Russian, the Russians are those who are more likely to colonize it.

Miss LINDGREN: That is a very difficult question. One has to differentiate the Russians from the Cossacks. I think, without entering on racial generalizations, one can say that the Cossacks are perhaps the best Russian stock one can find anywhere, and they conquered Siberia for the Russians. They seem admirably suited to conditions in Manchuria. Whether the other Russians, so called, and the other types of Russians could colonize the district is somewhat questionable, because so much of Siberia is still quite undeveloped, compared to what is being done to similar regions in Canada, for instance. I believe that the thickly forested region will remain for a long time quite undeveloped. The more open parts will certainly be occupied by Russians and Chinese; but in view of the political aspect one cannot predict.

Sir DENISON ROSS: I wish to express my great appreciation of the remarkable lecture to which we have listened. One point struck me as especially interesting. The trading which takes place across the Argun river, apparently four times a year, has a parallel in the very early history of Central Asia, where we are told there were people who traded but never met each other. One tribe crossed the river once a year, placed their goods on the bank, and then retired; later on the other tribe came and placed their goods on the bank in exchange, and again withdrew.

To me this has been an extraordinarily interesting evening because I have devoted a great deal of time to the study of Central Asia; and there is for me no more fascinating topic than the home of Chingiz Khan and the surrounding country.

The Rev. A. C. MOULE: I should like to echo what Sir Denison Ross has said. I had the honour of helping Miss Lindgren in some of her studies, and it has been with the greatest admiration and interest that I have listened this evening to an admirable account of her very remarkable journey.

The PRESIDENT: Mr. Moule, who has just spoken, helped to teach Miss Lindgren Chinese. That will give you an idea of how much Miss Lindgren knows. She is one of our youngest lecturers; the youngest but one, I think, that we have heard. We have had one younger, Mr. Watkins. Now we have Miss Lindgren, and she has shown that the young can do a great deal nowadays in geography, even if they are anthropologists. It seems to some that we are living in too great comfort in London, but if we want to get into contact with Nature we can go into those swamps, haunted by mosquitos, and be as uncomfortable as we like.

And when I speak of swamps I think I ought to say something about the swampy taiga; the swampy taiga is not an animal, though it may sound like it.

Miss Lindgren said that the maps were very inadequate. Maps are inadequate. That is one of the great comforts which geographers have: there still are inadequate maps. Miss Lindgren has given us some idea how the maps may be corrected, though I do not know that she has brought any maps back. Anyway, she knows that existing maps are wrong, and that is the great thing. It only remains for me, in your name and in the name of the Society, to thank Miss Lindgren for her singularly interesting lecture and to congratulate her on her admirable and adventurous journey, which has enhanced our knowledge very considerably.

SAMUEL PURCHAS

DR. E. G. R. TAYLOR

IT is customary to write slightingly of Samuel Purchas, and to inveigh against the editorial cuts which he felt to be necessary when publishing the mass of documents contained in the *Pilgrimes:* yet it should be remembered that Purchas reflected the spirit of his times, a dour Puritanism that seems all the more repellent by contrast with the gay, almost pagan charm of the days when Hakluyt was young; moreover, he wrote not for the archivist, but to satisfy the reading public of his day. That he did a very real service to the England of the early Colonial period can hardly be denied. By means of his *Pilgrimage*, which to-day is never read, he whetted the general appetite for the fuller narratives of overseas exploration and settlement which the *Pilgrimes* supplied, and by his enthusiastic praise of Hakluyt must have sent many a reader to the earlier English Epic.

It was Hakluyt's weakness (indeed, it was then a weakness of English geographical literature as a whole) that he could not compile from the vast documentary resources at his disposal a readable volume on the extra-European world which the ordinary man could master from cover to cover. No one could sit down and read the *Principal Voyages* from end to end, nor, if they could do so, would they carry away with them a comprehensive picture of world geography. When Hakluyt was asked for such a compilation, he merely produced a new translation, that of Galvano, which carried the reader up to a date already some half-century past. It is true that in 1599 a *Brief Description of the World* had appeared—the work of Bishop George Abbot; but it was merely a list of countries and their boundaries, towns and rivers, lightened by hardly a gleam of human interest.

Samuel Purchas, however, produced a volume that King James read through seven times, and since edition after edition was called for, it is clear that the public taste was also suited. The object of the *Pilgrimage* was only secondarily geography; the author designed in the first place to write a comparative history of religions; but as he believed, and rightly, that without "that so much neglected study of Geography" History "is sick of a half dead palsy," he made the fullest possible use of all available geographical works, including in the first

place Hakluyt's and Ramusio's Collections, which were veritable libraries to him.

As he naively confesses, for those pagan areas where there was comparatively little to say about religion, he filled his chapters with geographical description, and it is these sections of the volume, not the tedious pages on the Christian, Jewish, and Muhammadan religious practices, that give the book its value. Yet it must not be forgotten that the subject of the varieties of religious observances was not tedious to the Jacobean reader, who, attracted thereby, was led almost unawares to geographical study, only to find that geography had an interest which manuals such as George Abbot's had not prepared him to expect. Purchas' equipment for his task was not limited to his reading of Hakluyt and Ramusio: he was familiar with every geographical writer of any note, English or foreign, of the sixteenth century, besides those of classical times, and for every statement that he made gave a careful reference to his source, a practice which greatly enhances the value of his book, and one which makes it possible to check the formidable list of authorities which he cites by way of introduction. Nor was his equipment limited entirely to his reading, as will presently be shown.

Samuel Purchas, as is well known, took his degree at St. John's College, Cambridge (John Dee's old college), and passed from a curacy to an incumbency in his native county of Essex. As a scholar he mixed with scholars, and had seen the maize plant growing in the garden of Gerard the herbalist, with whose work and with that of all the noted students of plant-life—Clusius, Acosta, Pena, and Lobel—he was well acquainted. As incumbent of Eastleigh (Leigh), a Thames-side parish in Essex, he came across more than one retired mariner and foreign merchant, and the *Pilgrimage* is constantly enlivened by information obtained at first hand. His friend and neighbour, Andrew Battell, had lived among the natives of the Congo Basin, and also in Portuguese Brazil; Thomas Turner had had a like experience. Another neighbour, John Vassal, had been in Barbary; Master Simons had lived among the Turks, Master Allan had studied the ruins of ancient Babylonia, John Pountesse had rowed in his boat where once the walls of Carthage stood. Another friend, William Pursglove, had lived among the Samoyeds in north-east Russia, while Allen Sallows could give the parson direct information about James Hall's last voyage to the Arctic. Most widely travelled of all was George Barkeley, a London merchant, who had been in Poland, Livonia, and Russia, and had stayed as his guest with a tent-dwelling Tatar. This same George Barkeley was one of the adventurers to the Bermudas or Summer Islands, and could give Purchas details also about the Sargasso Sea. Nor was he the only link between the author of the *Pilgrimage* and the Virginia colonists before the first edition of the book appeared in 1613.

As was to be expected, Purchas' own library could not furnish him with all the books he required, and the deficiency was made up by his being made free of the great library of his friend Master Crashaw. This was the Rev. Wm. Crashaw, B.D., who was closely connected with the Virginia Company, and, whether through his influence or no, Purchas had access to the early unpublished records of the Council for Virginia in possession of their secretary, Robert Pots; while Captain John Smith, whose vigorous personality had saved the young colony from disaster, brought him his MS. and map which were shortly to be published at Oxford. Further, he was able to cross-examine

Henry Spelman, the youth who had lived a captive among the Indians, when he was brought home by Captain Argall in 1613. Another early friend of Purchas, the noted jurist John Selden, himself the associate of Camden and Sir Robert Cotton, was able to assist him with material and advice, and it was Selden who wrote an appreciative introduction to the *Pilgrimage*, which was dedicated to George Abbot, then Archbishop of Canterbury. Abbot in turn showed his appreciation by making the author his chaplain; and in a few years Purchas was presented to a London incumbency.

It is hardly to be wondered at that his first published work made an immediate and great impression among those who, in the face of enormous difficulties, were devoting their energies to overseas colonization and discovery. Containing so much that was of interest about the Americas and the East Indies, it might yet, they thought, contain much more, and Richard Hakluyt immediately threw open to the inspection of the Essex parson the store of unpublished manuscripts that he was accumulating in his Chamber at Westminster. Sir Walter Raleigh, too, came forward with further particulars of Guiana, while Sir Dudley Digges and Sir Thomas Smith made Purchas privy to the records of Hudson's voyages and many others to the north, and to the archives of the East India Company. The year 1614 therefore saw a second and greatly enlarged edition of the *Pilgrimage*, which epitomized and gave useful publicity to the efforts being made in all directions by the English Empire builders. Here appeared the first printed account of Hudson's fatal voyage, and here likewise first appeared the story of Peter Carder, the sole survivor of the group of men abandoned in the pinnace by Drake near Magellan's Strait.

In the *Pilgrimage* of 1614 the list of references is very greatly enlarged (from 700 to 1200), and there is added for the first time a list of unpublished as well as published material, the former including practically all the manuscripts which subsequently saw the light in the *Pilgrimes*, more than ten years later. Among the new printed authorities it is interesting to find a group of modern astronomers, perhaps brought to Purchas' notice by his friend (newly made?) the mathematician Henry Briggs. They include Copernicus, Tycho Brahe, Kepler, and Galileo, whose discoveries by means of his telescope receive special mention, as bearing on the question of the heavenly firmament. There was in England, of course, no divorce between science and religion, and the Protestant Divine could quote freely from contemporary and classical philosophers, just as he could make free use of the abundant writings of the Jesuit Fathers, who were the main authorities for the geography of China, Japan, and the Far East generally. As a good geographer he made constant references to the map—Mercator, Hondius, the Theatrum, the Maginus edition of Ptolemy, or, for Africa, Livio Sanuto; and he mentions with interest the great Map of China, possibly Father Ricci's, having the names in Chinese characters, that hung on Hakluyt's wall.

Samuel Purchas' debt to Hakluyt was great; he was the first to acknowledge that such was the case, but sufficient has been said to indicate that he was more than the fortunate possessor of the Hakluyt manuscripts. He not only contributed a large proportion of the material of the *Pilgrimes* himself, he contributed to geography a useful compilation that took a form which appealed to the public of the seventeenth century, however repellent it may appear to the

captious critic of the twentieth. He did more, he put geography in its right place in the scheme of learning: "Geography without History seemeth a carcass, without life and motion: History without Geography moveth, but in moving wandereth as a vagrant, without certain habitation."

BRITISH POLAR EXHIBITION, 1930

AN exhibition of particular interest to Fellows of this Society will be held at the Central Hall, Westminster, from July 2 to July 15 next, designed to illustrate the achievements of British Polar explorers from the earliest time, but with a particular appropriateness in view of the great activity in Polar exploration during the present century.

The exhibition is promoted by a Committee which includes Doctor Hugh Robert Mill, our Vice-President, Sir Richard Gregory, Dr. G. C. Simpson, the Director of the Meteorological Office, Mr. J. M. Wordie, Chief of the Scientific Staff of the Shackleton Antarctic Expedition, 1914–1917, Mr. Frank Debenham, Director of the Scott Polar Research Institute at Cambridge, Mr. L. W. G. Malcolm, Conservator of the Wellcome Historical Medical Museum, and Commander L. C. Bernacchi, Physicist to Scott's expedition in the *Discovery*, who is the Organizing Director of the Exhibition. The exhibition has received the approval and support of the Council of this Society, the Lords Commissioners of the Admiralty, the *Discovery* Committee of the Colonial Office, the British Museum (Natural History), the Hudson's Bay Company, and the High Commissioner for Canada. Many learned societies, museums, and collectors have readily agreed to lend to the exhibition Polar relics from the early Arctic expeditions, the Antarctic relics of the Scott and Shackleton expeditions, charts and historical documents, portraits of explorers and paintings of Polar scenes, models of ships, flags, medals, and a great variety of equipment.

The exhibition will be in four sections. In the Small "D" Hall will be found the relics, historical documents, and paintings of historical interest. In the Larger Hall will be collections representing more modern Polar work, and exhibits in the Small Conference Hall will include the recent research on whales and whaling in the Southern Seas. The Library Hall will be devoted to the exhibits of firms who have supplied Polar expeditions with equipment, provisions, and gear.

A Polar Manual is being prepared for sale in the exhibition with short authoritative articles on Polar Discoveries, Meteorology, Geophysics, Geology, Glaciology, Whales, Mammals, Birds and Fish, Transport, Diet and Equipment, illustrated by maps of the northern and southern Polar regions. A large number of recent books on modern Polar work will also be on sale.

A lecture on South Polar Exploration will be given in the Large Hall on the evening of July 2, and on North Polar Exploration on the evening of July 10 by lecturers whose names will be announced later. The film of the Second Scott Expedition recently acquired by the British Empire Film Institute will be lent by the Trustees of the Institute, and will be shown every evening in the

Large Conference Hall. The services of the organizers of this exhibition are given voluntarily, and they hope that after paying the costs there may be a surplus available for distribution to institutes or societies engaged in geographical research. They hope, therefore, that the exhibition will be well supported by all those interested in geography, and they will be happy to receive donations to the Exhibition Fund, which will increase the surplus to be devoted to geographical research. The address of the Committee is Carlton Chambers, 8, Regent Street, S.W.1. Telephone Regent 1376. Applications for tickets or any other communication should be addressed to the Organizing Director.

ENCYCLOPAEDIA OF GEOGRAPHY

ENZYKLOPÄDIE DER ERDKUNDE. Edited by DR. OSKAR KENDE. *Leipzig and Vienna: Franz Deuticke* 1923, *in progress*. 10×7 *inches*

THIS work represents a continuation, after a lapse of some years, of a project initiated by the late Prof. Maximilian Klar, and the General Editor is to be congratulated on his success in reviving it and also upon his present list of collaborators. Of the thirty-one volumes of the series as now arranged, the eighteen which have so far been published—with the exception of Nos. 2, 3, 13, 14 (out of print), and 15, published as parts of Klar's series, and two sub-sections of No. 6, which have not yet appeared—will serve as the basis of a general survey, and the following remarks will be directed mainly to general features and to the value of the series as an exposition of modern problems and methods of attack.

The term encyclopaedia has in English fairly well-accepted connotations to which an Encyclopaedia of Geography might be expected to conform. In this series, however, the subjects are not arranged alphabetically, but the volumes, which vary very much in length, deal individually in the earlier numbers with different branches of General Geography—such as Geomorphology and Plant Geography, and in the later with regions of the world. At the same time in such a work a reasonable degree of authoritativeness may be assumed, and the authors contributing to this series nearly all combine first-hand knowledge with scientific skill and power of exposition. The bibliographies are full and often comprehensive. Machatschek's select list to his 'Mitteleuropa' (No. 17), for example, contains 1032 references, and Maull's 'Südeuropa' (No. 22) must contain considerably more. The absence of references to literature in the English tongue is, however, regrettable in some cases, as in No. 6 (*a*), where there is no reference to the work of Meinzer and others; and in No. 4, where there is none to English and American research.

As regards matters of fact, some of the volumes, such as No. 4, 'Paläogeographie,' by Prof. Dacqué, are admittedly only sketches or introductions to the subjects discussed. Some of the authors take their duties as "encyclopaedists" literally; others exercise selection, while others adopt combined methods. But all attempt to be thorough, and several of the volumes are massive, while all are compact. The text is clear, but the long and close-set pages of print, sometimes in small type and unrelieved even by paragraphing, will repel English readers and limit the sphere of usefulness of the work. In the important matter of illustration, also, many of the volumes leave a good deal to be desired. No. 22, 'Südeuropa,' by Maull, is by far the best in this respect. Indexes are provided and, in some

cases, statistical tables, lists of (German) equivalents for foreign terms, etc. As regards treatment there is a good deal of freedom. In the series as a whole, however, the field of modern Geography is, as it were, laid out before us and becomes concrete, while at the same time the vigour and originality of the Central European schools are strikingly illustrated.

The series is numbered consecutively, but, as has already been indicated, we may recognize in it two main divisions—a general and a regional. No. 1, 'Methodenlehre der Geographie' (1929), consists of (*a*) "Die Geographie als Wissenschaft," by Dr. Viktor Kraft, and (*b*) "Die Geographie als Lern- und Lehrgebiet," by Dr. Felix Lampe. Dr. Lampe is an eminent educationalist, and his contribution, occupying 263 out of a total of 285 pages of close print, is concerned with the pedagogy of the subject. Dr. Kraft's contribution deals with the nature and functions of Geography as a science, its place in the family of sciences, and its special technique and modes of investigation. On p. 12 a conclusion is reached which may be summarized as follows: The science of Geography is not simple or single: we must recognize in it a dualism. General Geography deals with types and the operation of laws: it is a *Gesetzeswissenschaft*, like Physics. Regional Geography, on the other hand, is an *Individualwissenschaft;* it aims at the description and genetic explanation of regions (or areas) as individuals in their own right (cf. History). This dualism is basic, more basic than the dualism between, say, Historical and Physical Geography or between Physical and Human Geography. It is also ineradicable and unsurmountable and is implicit in all geographical research; for between the "generalizing" and the "individualizing" modes or trends of thought there is no bridge.

Nos. 4, 6 (*a*), 7, and 10 are of this "generalizing" type. No. 4: 'Paläogeographie' (1926), by Dr. E. Dacqué, has been reviewed in this *Journal* (May 1927, p. 478). In No. 6 (*a*), 'Physiogeographie des Süsswassers' (1925), Dr. W. Ule, with the collaboration of Dr. O. Lehmann in Section 1, gives a summary of the general principles of the hydrology and hydrography of the lands, a useful feature being a paragraph at the end of each section discussing the geographical distribution of the phenomena dealt with. No. 7, 'Lufthülle und Klima' (1923), contains sections (*a*) "Atmosphärenkunde" (pp. 1–148), in which Dr. A. Defant gives an outline of Meteorology; and (*b*) "Die Klimate und ihre geographische Verbreitung" (pp. 151–180), in which Dr. E. Obst discusses the principles of the classification of climate and their application in Geography. In this second section the author reviews the various modes suggested for classifying climate and, selecting the meteorological—*i.e.* substantially, Köppen's—distinguishes and describes eleven climatic "realms" (Klimareiche) upon the globe, with subdivisions, climatic "provinces" (Klimaprovinzen) and climatic "regions" (Klimagebiete). In conclusion he sketches a division of the individual continents and oceans into such climatic "regions." No. 10, 'Tiergeographie' (1925), contains a summary of the principles of Animal Ecology as developed by Dr. F. Dahl.

The above volumes deal with General Geography in the usual accepted meaning of that term. They are mainly written by specialists in cognate sciences, with the outstanding exceptions of Dr. Ule and Dr. Obst. The relation of such sciences to Geography is still perhaps in some quarters unnecessarily obscure. Informed opinion in this country is reasonably clear as to what Geography asks of allied sciences—as clear, for instance, as Physics is as to what it needs from Mathematics, Botany from Chemistry, and so forth. But as parts of an Encyclopaedia of Geography some of these volumes seem to originate in a view which is dying out where it is not altogether obsolete, and which has led to unnecessary difficulties and to the antinomy referred to by Dr. Kraft (*v. supra* and *cf.* the review published

in this *Journal* for December 1927, p. 585, of E. de Martonne's 'Traité de Géographie Physique,' vol. 3, Edn. 4).

Of the regional volumes, No. 18, by Dr. G. Braun, 'Länderkunde Nordeuropas' (1926), and No. 21, by Dr. J. Moscheles, 'Länderkunde der Britischen Inseln' (1925), have already been reviewed in this *Journal* (May 1927, p. 463, and April 1926, p. 363, respectively). No. 31, by Dr. O. Nordenskjöld, 'Nord- und Südpolarländer' (1926), may be compared with a series of similar and partly more recent works by British, American, and German authors, but the essay by Dr. H. Reck upon Iceland and the Faeroes ("Island und die Färoer") will probably have a more current value. No. 24, by Dr. M. Haltenberger, 'Die Baltischen Länder' (1929), is of interest as being the first systematic work independently published upon the new Baltic States of Estonia, Latvia, and Lithuania. The text is well fortified by statistics, but otherwise follows somewhat conventional and monotonous lines. No. 17, 'Länderkunde Mitteleuropas' (1915), and No. 16, 'Europa als Ganzes' (1929), are by Dr. F. Machatschek. The earlier work, containing 370 pages of closely packed text, is perhaps encyclopaedic rather than geographical, and the morphological element is generally over-emphasized. More scientific interest attaches to the later volume (95 pages of text), which essays the difficult task of summarizing the geographical features of the Continent. No. 22, by Dr. O. Maull, 'Länderkunde Südeuropas' (1929), though bulky (532 pages of text with very full bibliographies), is one of the most interesting volumes of the series. It provides the best systematic recent account of the geography of the Italian, Balkan, and Iberian peninsulas. It gathers together a vast body of scattered scientific work and is reasonably well illustrated by sketch-maps, diagrams, and statistics. A pupil of Theobald Fischer, Maull knows his ground, and his work possesses no little interest as an essay in scientific treatment (cf. his 'Griechisches Mittelmeergebiet,' 1922). Opinions may differ as to some of Maull's theories (*v. G.J.*, February 1926, p. 177): his treatment of political geography, even in the present volume, is novel and sometimes difficult to follow. His conception of regional geography, on the other hand, is shared by some of the most brilliant of his colleagues. It is only a pity that in the volume under review he has not yet achieved conciseness.

It remains to notice one or two features of these regional volumes which are of general interest, since essays by leading exponents of the subject may be expected to reflect, individually or in groups, modern trends and conceptions.

The distinction between general analysis and regional synthesis, which may be regarded as that between the abstract and the concrete in geographical treatment or, by analogy, between the anatomy and the physiology of the area studied, is observed by all the authors except Haltenberger, who, dealing with an area small in itself and politically subdivided, seems to attempt a fusion of both treatments. The analytic treatment usually precedes the regional, but Nordenskjöld treats his regions first and proceeds, on this basis, to general characters ("Die Polarnatur in ihrer Gesamtheit," *op. cit.*, Section D).

The geographical analysis is fairly uniform, and most authors follow the now almost stereotyped categories (position and general relationships; structure and geomorphology; climate; plant and animal distributions; etc.). Machatschek, however—perhaps because as a geomorphologist he is conversant with the evolution of the physical forms—recognizes the significance of the evolution of the human forms of the landscape and his chapters on the "historical" development of population and settlement ('Mitteleuropa,' chap. v and 'Europa als Ganzes,' chap. vi) are interesting and suggestive. Maull, on the other hand, shakes off the trammels of the conventional "rota" and recognizes three main aspects of each of his areas: (i) Basic geographical characteristics (Wesen) and relationships:

e.g. size, shape (horizontal and vertical plans), regional position, world position. (ii) The natural landscape (Naturlandschaft): structure and geomorphology, climate, vegetation and biogeographical characters. (iii) The humanized landscape (Kulturlandschaft): the human (cultural) forces and their evolution in the given environment; anatomy of the humanized surface. In this treatment Maull has probably attained the high-water mark as regards methods of general geographical analysis.

As regards regional synthesis we must recognize two aspects: (i) Four authors attempt a geographical characterization of major areas: viz. Braun, "Nordeuropa als geographisches Individuum" (*op. cit.*, chap. v); Machatschek, "Mitteleuropa" (*op. cit.* Allgem. Teil, chap. i); Maull, "Südeuropa" (*op. cit.*, Sect. A); and Haltenberger, "Das Baltikum" (*op. cit.*, pp. 1–7). (Cf. Andree-Heiderich-Sieger, 'Geographie des Welthandels, Bd. i, 1926, "Europa," where "Mitteleuropa," "Westeuropa," and "Südeuropa" only are characterized as geographical "entities.") The chapter in Braun referred to is largely in the nature of an appendix or summary. Maull devotes his first section to this problem and then treats each of the peninsulas as a unit, but in the case of the Balkans he compromises by recognizing regions (Länder, *e.g.* "Die ägäischen Länder"); sub-regions (Landschaften), and States. Machatschek, in his 'Mitteleuropa,' compromises by devoting a special section (Allgemeine Teil, chap. vi) to a general survey of the individual States and, having disposed of them, proceeds to deal with regional and sub-regional divisions (Landschaften). Haltenberger, after analyzing his "Baltikum," deals directly with its three component States. These attempts at a geographical characterization of major areas are of special interest since they apply to Europe where the difficulties are well known. Thus none of these four authors entirely discards the treatment by political units, and the manner in which they individually compromise with this difficulty is eloquent both of the present state of geographical science and also, we should not forget, of the state of Europe.

(ii) Regional sub-divisions (Landschaften or Einzellandschaften) of various orders are recognized by all authors except Haltenberger. The degree of emphasis differs. Braun's work consists mainly of synthetic regional characterization (Landschaftsbeschreibung). So does Machatschek's 'Mitteleuropa,' while in 'Europa als Ganzes' the regional divisions of Europe are merely indicated. In Maull's work some 300 out of 530 pages are devoted to detailed regional treatment. The principles of sub-division, though they are important, cannot be considered here. The sub-divisions adopted by different authors do not always agree over the same area—Braun apparently adopts different divisions for Fenno-scandia in two different published works—and it would be instructive to compare from this point of view the volumes of this series with one another and with other treatises upon the same areas. O. H. T. R.

REVIEWS

SOUTH WALES: a Physical and Economic Geography. By S. W. RIDER and A. E. TRUEMAN. *London: Methuen & Co.* 1929. 8×5 *inches;* viii+190 *pages; sketch-maps and diagrams.* 4*s*

This is a good example of a local geography compiled primarily for use in the schools of the area with which it deals. Each of its fifteen chapters is an account of those features of South Wales which illustrate a particular factor or aspect of geography, such as Climate, and Inland Transport. The authors assert (p. v) that "South Wales may be considered as forming a geographical unit" and appear to regard it as a more distinct unit than Wales as a whole, but make no attempt to define the limits of this unit or to explain its unity. Perhaps the most interesting chapters are those on the Coal Trade and on Population Changes, which clearly show that the development of this densely peopled industrial region is almost wholly an affair of the last 150 years, and suggest that it may be only a passing phase. The last chapter is an expansion of an article contributed by Dr. Trueman to the *Journal* in 1919 (vol. 53, pp. 410–419). A very valuable feature of the book is the list of references given. C. B. F.

THE PLACE-NAMES OF SUSSEX. By A. MAWER and F. M. STENTON, with the assistance of J. E. B. GOVER. Part II. The Rapes of Lewes, Pevensey and Hastings. (English Place-Name Society, vol. 7.) *Cambridge: University Press* 1929. 9×6 *inches;* xlvi+250 *pages; and map.* 40*s for two parts*

In this second and concluding part of the 'Place-Names of Sussex' (see *Journal*, 75, 1930, 177–178) the authors deal with the Rapes of Lewes, Pevensey, and Hastings, and the index to the names in both parts is given. In the section on elements, apart from personal names, found in Sussex place-names, a large number of additions is made to those originally given in the volume on The Chief Elements used in English Place-Names; and there is a long list of personal names compounded in Sussex names which are either in independent use or inferred with different degrees of probability. How people will assimilate less-known elements to the more familiar is abundantly illustrated. Thus the family name le Frye shapes itself to Friar's Oak, in Buttinghill Hundred; Cartstreet (or Catstreet for two centuries, probably named after the Cat and Fiddle Inn) was changed to Cade Street through association with the rebel Jack Cade, who was captured close by; the wood in which were the buildings of one Eorcon easily becomes Yorkshire Wood; and a *fearn leah*, or bracken clearing, is altered to Fairlight, "possibly from some imagined connexion with that word (light) owing to its beacon-like position." Cuckfield is explained as possibly "cuckoo-haunted open land"; but in spite of the kuku- and cucu-feld forms of the early twelfth century, which may be similar popular assimilations, the explanation seems a little far-fetched, as it is hardly likely that a district should be named from the few weeks in the year in which the cuckoo is heard. Naturally there are instances where a definite conclusion cannot be reached: neither Glynde nor Mount Caburn can yet be satisfactorily explained. Firle is still a puzzle, and how "servant" and "bridge" came to be associated in Groombridge is not known. The meanings of Wannock and Dixter are still uncertain: and for the difficult word Exceat (near Seaford) the best solution available (settlers by the river Exe) seems highly problematical. On the other hand, we have certainty about Robertsbridge, which we had been led to believe was a corruption of Rothersbridge: rather it is the other way, and the bridge which was named from Robert de St. Martin, founder of the abbey there, nearly succeeded in becoming Rothersbridge, when the Eastern Rother was renamed. Much has been said about Portslade and its connection with a

Roman harbour; but the editors definitely reject port = harbour, and explain as the shallow valley (slade) connected with a personal name. Of the name of the county town, Lewes, the earliest known form is Laewe, from OE. Llaew, a prominent hill. But the plural form has to be explained either as referring to several hills hereabouts, or as derived from an "unexplained tendency in Norman times" to give to names plural forms. The name Brighton was not in common use till the early sixteenth century: its meaning is Beorhthelm's farm. We quote a few interesting explanations of provocative names: Danny, well-watered land in a valley; Slaugham, sloe settlement; Twineham, at two streams (at tweoxneam); Offham, the crooked ham(m), on a bend of the Ouse; Southease, south brushwood land (hese); Horsted Keynes, place where horses were kept, belonging to William de Cahaignes, *i.e.* from Cahagnes; Pilt Down, Pileca's hill; Frant, place overgrown with bracken (OE. fearn); Mayfield, open land where mayweed grows; and Rye, at ther ye (island), transformed into "at the rye," and so shortened into Rye. The treatment of Sussex place-names in this volume is most interesting and complete. S. E. W.

ISLES OF THE AEGEAN. By V. C. Scott O'Connor. With an Introduction by H.R.H. Prince Nicholas of Greece. *London: Hutchinson* [n.d.]. 10×6 *inches;* 384 *pages; and illustrations.* 28*s*

This is a book to delight those who know the Greek Islands, by its vivid descriptions of the country and its sympathetic studies of character and manners. Insular Greeks are in many ways different from their mainland compatriots; they have suffered as little in essentials from modern democracy as they did from Turkish mismanagement; those whom the ancient ways aggrieve go to sea, to Athens, till recently to America; and many of them come back, for sheer homesickness, even if they have already been home to take a wife from among their own people. They live a hard life, like their ancestors in all ages; but the "man of Sikinos or Pholegandros" has his compensations, even if he has been "called up" by national emergencies for a considerable part of his life. Mr. Scott O'Connor loves the islands, and his choice of photographs, and of his landscape painter, Mr. Himona, supplements very pleasantly his verbal descriptions. But he loves the islanders more, and the result is a storehouse of anecdote and characteristic incident, in picturesque and geographically suggestive setting. Without any pretence to the background of scholarship, and the enthusiasm for research that makes the 'Inselreise' of Ludwig Ross a classic and a joy for ever, this is a real addition to the literature, and—if one cares to index it—to the geography, of one of the few almost unspoiled bits of the Mediterranean world. J. L. M.

TREASURE OF OPHIR. By Commander C. E. V. Craufurd, r.n. (retd.). *London: Skeffington & Son* (1929). 10×6 *inches;* 288 *pages; illustrations and sketch-maps.* 18*s*

There is much interesting matter in this book, in spite of the fact that we cannot agree with the conclusions drawn by the author from the evidence he puts before us. He gives the impression of being an enthusiast who makes the facts fit his theories rather than a discoverer whose theories are deduced from actual facts.

We may concede that his beliefs have a basis of possibility from a topographical and etymological standpoint, but we require something more reliable in the way of literary and archaeological evidence to convince us either that Dhofar is the original land of Ophir, or that the Queen of Sheba had a palace on the shores of lake Moesis. From an extensive knowledge of the East the reviewer does not feel able to regard mere local legend as valuable aid to the establishment of definite and detailed historical facts concerning personages of whom little has hitherto

been discovered. The fanciful description of the origin and evolution of Adamic man and his subsequent progress toward the land of Ophir, as given by the author, reminds us of the Arabian Nights. Here is one more to add to the theories already advanced on the much-discussed subject of the development of the human race! There is one interesting result, however, which might be obtained from Captain Craufurd's travels and researches. With well-constructed roads and well-organized motor transport the comparatively unknown regions of South Arabia might become centres of interest to the traveller and busy marts to the trader, restoring what may once have been their ancient dignity and prosperity. Much else might also be found, but the present writer has himself visited the highlands of "Shibaum," 20 miles to the north of "Al Bilad," in search of frankincense and allied products, and succeeded in obtaining specimens of eight different varieties, some of which were classed as bdellium by the expert to whose examination they were ultimately submitted. Incidentally, there is no evidence to support the suggestion that bdellium is a mineral product.

Captain Craufurd has taken his theories seriously from an early age, and has expended a large amount of painstaking work in developing them. His steadfast pursuance of the aim set before him, undeterred by all obstacles placed in his way by time, distance, or lack of opportunity, fills us with admiration. He tells his story in an easy narrative style which combines happily the racy yarn of the sailor with the interesting and detailed account of the experienced traveller. His anecdotes of Bedouin life and characters are especially interesting, though it is perhaps unfortunate that in the transliteration of Arabic words he did not follow one of the recognized systems generally employed by writers on Eastern subjects, and that he did not consult some authority when discussing Arab titles and dignitaries.

The book is well got up, and the illustrations are most attractive and well selected. W. G. G.

ASIE OCCIDENTALE. By R. BLANCHARD. HAUTE ASIE. By F. GRENARD. (Géographie Universelle publiée sous la direction de P. Vidal de La Blanche et L. Gallois. Tome VIII.) *Paris: Armand Colin* 1929. 11×8 *inches;* 394 *pages; illustrations and maps.* 100 *fr.*

This handsome volume, the eighth of the new issue of Géographie Universelle, with its 59 diagrammatic text-figures, its 66 plates of artistically reproduced photographs and maps, its summary of existing knowledge written with the interest of a reader and not the terseness of a text-book, and its up-to-date bibliographies, provides a most useful introduction to the study of the areas it describes.

It deals with two sections of the continent, "Asie Occidentale," by Prof. Blanchard of Grenoble, and "Haute Asie," by M. F. Grenard. The part dealing with Western Asia, which is rather South-Western Asia, considers Asia Minor, Armenia, the Caucasus, Persia, Syria, Mesopotamia, and Arabia, and lays stress on their geographical unity. As most of these countries lie along the great Alpine-Himalayan Mountain-System they have a marked unity of structure; but Arabia, being one of the Southern Asiatic plateaux, is essentially distinct both in structure and geographical history. The coloured map of the relief and topographical divisions of South-Western Asia (opp. p. 8) suggests the correspondence of Arabia with Southern Persia and Baluchistan by minimizing the importance of the mountains behind the Mekran Coast. The accounts of the mountain structure are clear and simple. The structure of the Caucasus is described as a chain overfolded by pressure from the north and with a well-marked asymmetry between the regular simple sequence on the long northern slopes and the confused tangle on the steep southern front. The Hindu Kush, on the other hand,

though also due to pressure from the north, has an apparently simpler structure, as it is composed of old rocks, gneiss and granite, with blunt worn-down summits; its most striking features are the profound gorges due to corrosion by the rivers and indicating very recent uplift.

The fullest sections are on the economic and political geography, and are of special use from their reference to post-war history, such as the destruction of Smyrna during the expulsion of the Greeks by the Turks, and the development of Syria and Palestine illustrated by a sketch-map of the Jewish colonies. The sketch-map of Palestine exaggerates the continuity of the parallel walls of the Ghor or Jordan–Dead Sea Valley. The author assigns the indented western coast of Asia Minor to tectonic dislocations. In the account of the Caucasus he refers to the remarkable achievement of the Russian engineer, Cerebrovski, the "dictateur du naphthé," in modernizing the methods of oil production and in so greatly increasing the production of the Caucasian oilfields (p. 58). The great development of nationalist feeling in Persia and Afghanistan are remarked as especially prejudicial to British influence.

In an eloquent concluding survey Prof. Blanchard summarizes the essential characters of the lands and the peoples in South-Western Asia and points out the difficulties in their government. He predicts that the present developments will not proceed without *secousses*, and in confirmation adds a note at the end of the index on the riots in Palestine on 23 August 1929. He had had the prescience to include an excellent photograph of the Wailing Wall. He represents the ambition of the new Turkish regime to establish a great Turanian empire as a menace to the peace of Western Asia.

The section by F. Grenard, well known as a writer of geographical insight on Central Asia, includes three divisions: Mongolia, Chinese Turkistan, and Tibet. They form a natural group—the Central Highlands of Asia. Some overlap with the other section is shown by the two references to Badakhshan being in the second part and not in that which includes Afghanistan. The three areas are along the east-to-west-trending mountains of the Himalayan–Altaid System. The map (pp. 252–3) showing the plan of those ranges does not express the change in their interpretation in the south-eastern part, where the lines marked are of the river divides and not the mountain structures. To English readers the place-names are occasionally unfamiliar. Everest is given a synonym Djomokangkar; three synonyms are given of the "Fleuve Bleu," but they do not include that of the Yangtze Kiang. The "mole Serindia" is accepted without reference to its rejection by Mushketov, the chief authority on the area.

The volume is obviously intended to be of service as an interesting and graphic representation of the countries rather than an encyclopaedia of facts. The statistical information is given in notes at the end of each chapter, and so is convenient for reference and for revision. Few references are given in the text, but the general literature is catalogued in well-selected bibliographies, and the authors give their interpretation of it in this valuable and readable monograph. J. W. G.

THE FORMER GLACIATION OF THE EAST LIDAR VALLEY, KASHMIR. By Lieut.-Colonel JOHN L. GRINLINTON. (*Memoirs of the Geological Survey of India*, vol. xlix, part 2). *Calcutta* 1928. 100 *pages; illustrations and maps*

This book, which is well illustrated with photographs, diagrams, and sketch-maps, is a thorough and careful study of the former glaciation of the East Lidar Valley in Kashmir. An immense amount of material about moraine deposits, striated boulders, and glacial troughs has been collected and carefully investigated. The author's views on the history of the former glaciation of the Lidar Valley may be summed up as follows.

During the first glacial period, described as "the high-level or upland epoch of glaciation," vast regions of the country were buried under ice. Valley-cutting and dissection of the area only followed afterwards. A "low-level epoch of glaciation" was then the cause of certain well-preserved glacial forms. This epoch may be divided into several periods. During the first of these the glaciers advanced as far as the Phalgam area where terminal moraines were deposited at 6930 feet. Higher up in the valley at 8200–8300 feet there are other terminal moraines (Nekabatun area) which, according to the author, belong to the second period, while the third period is represented by a dyke at Tolyon (9000–9500 feet). In the lower part of the Lidar Valley only one single trough can be recognized, while in the upper part two troughs are to be seen. After the first and second period of the low-level epoch of glaciation the glaciers advanced again, but they were much smaller. Then followed a grand recession during which such features as minor horns and dumps were formed.

The paper is a valuable contribution to our knowledge of the former glaciation of the North-Western Himalaya. E. T.

SPEDIZIONE ITALIANA DE FILIPPI NELL' HIMÀLAIA, CARACORÙM E TURCHESTÀN CINESE (1913–1914). Series II. Resultati Geologici e Geografici. Vol. 4. Le Condizioni Fisiche Attuali. By G. DAINELLI and O. MARINELLI. *Bologna: Nichola Zanichelli* 1928. 12×9 *inches;* viii+474 *pages; illustrations and maps*

The huge glaciers of the Karakoram that were originally described by Godwin-Austen in *Journ. R. Geogr. Soc.* (vol. 34, 1864, pp. 19–56) and were explored by Sir Martin Conway in 1894, and subsequently by the Workmans, Sir Hubert Hayden, and others, are now the subject of a detailed monograph in one of the volumes on the work of the De Filippi Expedition in 1913–14. The report on the glaciers was begun by Olinto Marinelli; after his death in 1926 it has been completed by G. Dainelli, who contributes an introductory appreciation of Marinelli's geographical work.

The volume is divided into four main sections. The first is a descriptive catalogue of the Karakoram glaciers, and gives a detailed account of their size, features, and relations, and is illustrated by many maps and photographs. The second deals with the limit of the snow-line in the Karakoram and Western Himalaya; it discusses the results of H. Schlagintweit, according to whom the lower limit of permanent snow in the Western Himalaya is at 15,000 to 18,000 feet. According to the observations of the De Filippi expedition, the present limit is from about 12,500 to 19,000 feet (p. 205). In the third glacial extension in the ice age, the permanent snowfields extended beside the Karakoram down to 12,300 feet, and in Kashmir near Srinagar, on the flanks of Pir Panjal, to 10,700 feet. In the fourth glacial extension the line was at 13,000 feet.

The third and longest section of the work (pp. 215–400) describes the characters of the Karakoram glaciers. They include the typical examples of Prof. Hobbs' "dendritic glaciers"; he selected them as the type ('Characteristics of Existing Glaciers,' 1911, p. 47) upon Sir Martin Conway's descriptions of the Baltoro, Biafo and Hispar glaciers. This section also deals with the rate of flow of the glaciers to which it makes no fresh contributions, but summarizes the results of previous workers, such as the 1·774 m. per day of the Baltoro glacier determined by H.R.H. the Duke of the Abruzzi as the mean of 62 days' movement in the summer of 1909; also the measurements by the Workmans in 1902 of the Chogo Lungma, which varied from half to one metre a day. The author considers the formation and distribution of the glacial pinnacles, the numerous glacial lakes and pools, the moraines, the formation of glacial dams, and discusses at length the

extent and character of the oscillation of the glaciers, and especially that of the Shyok, of which the records date back to 1780.

One feature of special interest in the glacier fronts is their frequent termination in "Chinese Walls"—the type of ending well known in the glaciers of Greenland and Spitsbergen. The photographs of the front of the Rimu Glacier (Pl. 32, Fig. 1) and of the Great Akhtash Glacier (Pl. 52, Fig. 1) show that they are representative of that kind of glacier ending.

The last section deals with some special physiographic features. It describes the numerous local hot springs, which appear to be arranged along vertical Pleistocene dislocations; the temperature of the waters varies from 21° to 95° C., but is usually between 60° and 80° C. No analyses of the waters are recorded, but the springs deposit gypsum, soda, and some borax. These springs are assigned by the author to a deep-seated source. This section describes the salt pools and discusses at length the "colate di fango," or sudden rushes of mud and stones which are known locally as "shwa." They were described by Godwin-Austen and also by Sir Martin Conway, who explained them as a variety of avalanche.

The bibliography is full (it occupies nine pages), but the references do not mention the pages, which are always a useful guide to the length of the work cited, while in some cases, where the same title has been used in two journals, the reference in the text is left ambiguous. Some of the later Indian Survey publications, such as the paper by Major Mason, are not included.

This monograph, with its wealth of new information about these important glaciers and its careful collection and discussion of the work of previous explorers, will form a valuable work of reference, but its usefulness in that respect will be lessened by the absence of an index. J. W. G.

WHERE LION REIGN. By ARNOLD HODSON, C.M.G. *London: Skeffington & Son* 1929. 9×6 *inches; 287 pages; illustrations.* 18*s*

Mr. Hodson was for several years H.B.M. Consul at Maji, 80 miles north of Lake Rudolf. South-Western Abyssinia was then in a disturbed state, through raiding parties of ivory smugglers and gun-runners. To put an end to these activities and to re-open trade routes Mr. Hodson carried out seven journeys, largely in the region west of Lake Rudolf and north of the Uganda boundary. A summary of the topographical information collected, with a map, was printed in the *Geographical Journal* for May 1929. Though in this book the itineraries are given in detail, there is no map of any kind to guide the reader through the maze of unfamiliar names: for a clear understanding reference to the map in the *Journal* is essential. The author received every assistance from the authorities at Addis Ababa; unfortunately their authority is not always effective in the outlying provinces. Depopulated by brigands, the provinces are unable to support the forces sent to put down lawlessness; the latter accordingly resort to "living upon the country," and a vicious circle is thus established. Mr. Hodson's activities seem to have borne fruit, and he opened up a route with Gambela which, under settled conditions, should contribute greatly to reviving prosperity. He was, however, not only an official and traveller, but a big-game hunter also who seized every opportunity. On one occasion he shot five lions. He adds two appendices giving his personal views upon shooting and trekking: a third, on Abyssinian butterflies, is by Prof. E. B. Poulton. In this strenuous existence Mr. Hodson had often to face considerable danger, but he was always equal to the occasion and considerate to his followers.

FROM AN OLD CAPE HOMESTEAD. By MADELINE ALSTON. *London: John Lane* 1929. 8×5 *inches;* x+324 *pages; and illustrations.* 6*s*

The old Dutch homestead of which Mrs. Alston writes is only 40 miles from Cape Town. It lies in a beautiful valley, with an air of remoteness, though enjoying all the amenities of modern civilization. Around it is a fruit farm, and the first part of the book deals with life and nature as seen by a cultured Englishwoman who has made South Africa her home. Then follow a couple of chapters on poetry—English and South African. The next part of the book is devoted to birds, and the last to travel experiences in Swaziland, Portuguese East Africa, and Zululand (with a closing chapter on Thebes and dead-and-gone Pharaohs thrown in). It is all very worth while. There is in Mrs. Alston's pages plenty of humour, a good deal of wisdom, and a streak of discontent with "progress" and "development." Principally the book is valuable for its revelation of a delightful personality, and for its insistence on the fact that man does not live by bread alone. But it should be added that here we have vivid word pictures of Swaziland and Zululand, pictures which tell us truly what the land looks like. A professed lover of beauty, Mrs. Alston's special joy is the study of birds and flowers, but she is almost equally happy in watching the ways of wild animals, from the baboons around her farm to the rare inyala and the sportive hippo. F. R. C.

MAN-HUNTING IN THE JUNGLE: the search for Colonel Fawcett. By G. M. DYOTT. *London: Edward Arnold & Co.* 1930. 9×6 *inches;* x+244 *pages; illustrations and sketch-maps.* 12*s* 6*d*

Impelled by the fine incentive to succour a man lost and in distress, equipped by the experience of travel in neighbouring regions, well stored, with a stout heart and admirable execution, Commr. Dyott accomplished a journey of first-class importance of which his book 'Man-Hunting in the Jungle' is an account.

It is no detraction of Colonel Fawcett to say that he was a hard man to follow. If he did not deliberately cover his tracks, he made little effort to blaze them. This made Commr. Dyott's search the more arduous and difficult. From Cuyaba the tracks of Colonel Fawcett's party were fairly plain. At the Arame river the mules and bullocks were sent back and the remainder of the journey was accomplished by canoe and the four canvas boats that had been brought from New York. From here onward the adventure becomes absorbing. The description of fish, fowl and flora—the fauna amounts to little—is vivid and interesting, and the photographs add to the interest. Great trouble was experienced from ants and insects of all kinds, inflicting sores and consequent illness in no small degree. By the majority, apart from the adventure itself, the greatest interest will be found in the account of the various tribes met with. The sign language employed by Commr. Dyott in his communication with the Indians was developed to a high degree. Those who had the advantage of hearing his lecture at the Polytechnic Theatre will have their memories stirred by his written account. The description of his conversation with Aloique, which convinced Commr. Dyott of how Fawcett met his death, is dramatic. As in all countries where the mentality of the native is low, the coming of strangers was regarded with suspicion, and it soon became evident that the only reason that the party was welcome was the thought of how much they could get out of them either by demanding presents or by killing the whole party and dividing their stores. It is interesting to note that the communal idea of life involving strict division among all appeared prevalent. Dyott became convinced that the only chance of safety was by flight. Aided by a temporary withdrawal of the large number of Indians by whom his party was surrounded, at midnight—the date is not given—he made his decision, packed and left, bound north for the Amazon by the lower Kuluene and Xingu rivers. Fortune favoured

the traveller, and, aided at times by the Juruna Indians among whom he found one or two who knew a few words of Portuguese, the party traversed the rapids safely though with difficulty. By August 23 safety was assured, Dyott having left New York in February. It is a fine story.

The geographical information is more of a descriptive nature than one of record. The nature of the expedition enforced it. The absence of dates is tantalizing. May we hope that in another edition Commr. Dyott will give us some sort of log or diary giving these and distances, etc.

Attention may well be given in the proper quarter to the paragraphs on p. 223.

Whether further travel will reveal a past age of civilization or promise a future of prosperity we will leave those who read to judge. W. E. G.

DAS STANDORTSPROBLEM IN DER LANDWIRTSCHAFTSGEOGRAPHIE (DAS NEULAND OSTAUSTRALIEN). By ALFRED RÜHL. *Berlin: Institut für Meereskunde* 1929. 127 *pages; diagrams and maps*

The really important part of this book appears in the last twenty-odd pages, in which the material set forth in the preceding sections is utilized as a basis for a very penetrating discussion of the various and changing factors that underlie the whole question of the localization of agricultural industries. Dr. Rühl here contributes matter which stands in urgent need of being emphasized. The pages above mentioned are, in fact, packed with striking observations and deductions, many of which are only too unfamiliar to the compilers of economic geographies.

Eastern Australia has been chosen as a first-class example of a "new" agricultural region in which the gradual adaptation of industries to all the controlling factors can be conveniently studied. Three standard years (1862, 1892, and 1916) have been selected, and for each the statistics for the distribution of the various classes of live-stock and of all important crops have been collected and plotted on a series of diagrams. Developments and changes are noted in the text, and explanations are given with a completeness that indicates a wide knowledge of the available material. The diagrams, however, in which the points are plotted on the equidistant method from the statistics by counties, are apt to give a misleading impression for marginal areas where no allowance is made for obvious tailing off. Thus far we have straightforward economic geography mainly of the descriptive kind, but where others might leave off Dr. Rühl proceeds to develop his arguments with a wealth of illustrations from other countries. These deal with a complex field, and a few examples must suffice. It is shown that many other important factors besides the essential ones of favourable soil and climate influence in varying degrees the choice and distribution of various particular forms of agricultural production: that within an occupied region most forms of production are subject to ebbs and flows, to changes and even to exchanges of locality, especially in the newer countries; in other words, that fixity is partial only, and that while long-settled countries have advanced much farther than new countries towards final adaptation and relative fixity of agricultural industries, even there finality and fixity cannot, in the nature of the conditions, exist. The book is well worth careful study by any who are interested in the fundamental principles of what is, after all, the most important branch of economic geography. For the convenience of English-speaking readers a translation would be welcome. E. W. S.

THE PROBLEM OF KRAKATAO AS SEEN BY A BOTANIST. By C. A. BACKER. *Weltevreden: Visser & Co.* [N.D.] 11 × 8 *inches;* 300 *pages; and sketch-maps.* 16*s*

The author of this work shows that the size and topographical character of the island of Krakatao are such as to render a thorough investigation of the flora peculiarly difficult. Moreover, many of the species are of very local occurrence,

so that for comparison of the flora at different times it is essential that the same areas should have been studied. The early investigations of the flora were at long intervals of time, and were not only superficial in character but also purely local. Moreover the areas visited on successive occasions were not the same. The investigators were without critical knowledge of the flora of the region such as is essential to the recognition of non-flowering individuals and completeness in the inventory of a flora.

Adequate reasons are adduced for the view that there may well have been areas on the steeper slopes and in the higher ravines where remnants of the original vegetation survived either as seeds and spores in the soil, or buried rhizomes. The possibility that the original flora of the neighbouring islands of Lang Eiland and Verlaten Eiland may have been totally destroyed by the eruption is admitted, but these islands were unfortunately not investigated until recently. The case as presented by the author seems incontrovertible, that though the survival of plants is hypothetical, the evidence is clearly in favour of this possibility, which renders nugatory the elaborate superstructure of theory based on the assumption that the eruption wiped out the entire flora. "Taken as a whole, the botanical investigation of Krakatao in 1886 was a failure. Because of its superficiality it could not be otherwise."

Whilst the greater part of the work is occupied by a critical survey of the data obtained during the various visits to this area, the subject matter contains much valuable observation, as, for example, regarding the occurrence of introduced species. These are met with in the clearings and along the glades of the rain-forest, but in the forest proper "not a single one": a statement that recalls the similar dictum of Cockayne regarding the introduced flora of New Zealand.

One cannot read these pages carefully without realizing that they perform a real service to botanical science in placing the facts in their correct perspective, so that the oft-quoted "evidence" of Krakatao may be appreciated at its true value.

E. J. S.

LIFE IN THE PACIFIC FIFTY YEARS AGO. By ALFRED P. MAUDSLAY. *London: George Routledge & Sons* 1930. 9×6 *inches;* ix+261 *pages; two illustrations and map.* 10*s* 6*d*

To the Fellows of our Society this engaging book will have an especial interest. They have known its author for many years as an explorer, the father indeed of Central American archaeology; as a scholar, the editor of volumes for the Hakluyt Society, and Honorary Fellow of Trinity Hall; and as an ever-young Honorary Secretary and lately Vice-President of the Society. But there are not so many who have thought of him as playing an active and sometimes a prominent part in British colonial administration in the Pacific islands. It is nearer sixty years ago than fifty that he became Private Secretary to the Governor of Queensland, and after a few months of amusing but unconventional official life there was gazetted for special duty in Fiji on the staff of Sir Arthur Gordon. The larger part of the book is made of the author's recollections of the next four years, supplemented with long extracts from his letters home. Fiji was but recently annexed after a rather unsuccessful rule by a mixed government of natives and Europeans. Samoa, to which he was sent with a Consul's commission in 1878, had been the scene of a civil war, and many defeated chieftains had taken refuge within the fence of the British Consulate. "There were a small number of disreputable white men dabbling in native politics, in some hope of profit for themselves." A strong native party was anxious for annexation by Great Britain, while others had sent an envoy to Washington, and by far the largest commercial interest in the group was German. The British were collecting an indemnity for the murder of blue-

jackets. The American vice-consul was organizing the resistance of the native government to this demand, having been not unnaturally annoyed some while before when an American murderer whom he had arrested and put aboard an American vessel for trial in the United States had been carried off by a crowd of white men led by an Englishman and hanged near the British Consulate.

In Tonga, to which Mr. Maudslay was soon sent as Deputy Commissioner and Acting Consul-General, there was a native king under the influence of a British Wesleyan missionary who had just received the order of the Red Eagle for obtaining the cession of the best harbour to Germany for a coaling station. To make or wear native cloth was forbidden, and many of the people were hopelessly in debt to a German firm for money lent by their agent at the church door to support inter-village competition in offertories.

Such was life in the Pacific as Mr. Maudslay describes it fifty years ago. The author may be congratulated that in his eightieth year he had so rich a store of early recollections on which to draw and a pen still skilful to revive this far-off life. We meet many old friends in his pages: William Macgregor and George Le Hunte, and Anatole von Hügel who had to be persuaded out of bed in the morning by a fish-spear passed through the reed wall of his room. There are charming touches of description, as of the pet lorikeet, golden green, bright crimson, and purple, "but with nothing of the vulgarity of a gaudy-coloured parrot about him," who sat on the branch of a brilliant yellow croton which suited his style of beauty exactly. And there is much wise and kindly and humorous comment on the methods of native rule and white administration. "The native chiefs were rather shy about calling on me at first," he writes to a cousin, "but I let them know that I should be glad to see them, and all the native swells have now called, and I have had a great many of them to dine with me. They are very pleased, but cannot quite understand it. . . . The general decision arrived at is that it is a new thing, but decidedly *vaka turaga*—chief-like."

The scope of the book is wider than its title: we do not really get to the Pacific until chapter vii. To Harrovians we may commend our Vice-President's recollection of being arrested for a pickpocket while visiting Harrow races in disguise: to old members of Trinity Hall his account of the Dean who was too shy to rebuke an undergraduate unless he could manoeuvre to address his reflection in the looking-glass: yet on one long vacation set out for Khiva in silk hat, black coat, and white tie and stood up boldly to Skobelev when arrested in that guise, threatening to come next time from India.

One would wish that every old friend could write so well of his youth, to show how constant are a man's capabilities and tastes: in archaeology, in amusements, in housekeeping and building, Mr. Maudslay found the Consulate at Tonga wretchedly placed and undignified. "I found that it would cost £300 to build a three-roomed wooden cottage without offices, fencing, or furniture. A native house will, in the long run, cost as much; but instead of one of the miserable cottages the chiefs here live in, I shall have a really comfortable house and surroundings. The situation is not quite what I should have chosen, but it was the wish of the King and of the governing chiefs that I should live near them, so I made no objection. . . . I bought the old Roman Catholic church at Mafanga [a fine native building with greenheart posts and a bird-cage roof elaborately tied with sinnet] and made arrangements with David Unga for the prison labourers to move and rebuild it at a certain price. . . . The work keeps us in good health without the necessity of going long lonely walks along these very dull roads. I hope to finish the new Consulate without giving a day's work to a professional carpenter."

SKRIFTER OM SVALBARD OG ISHAVET. Nos. 1, 13, 15–17, 19–26. MEDDELELSER, Nos. 1–8. Norges Svalbard-og Ishavs-Undersokelser. *Oslo: Kong. Dept. for Handel, etc.* 1929

The early numbers of *Skrifter om Svalbard* were reviewed in the *Geographical Journal* in November 1928. The Society has recently received a further collection of these memoirs and also the first parts of a second series, the *Meddelelser*. The *Skrifter* (Publications) are practically all written in English, and up till now have been almost purely geological. The *Meddelelser* (Communications) are written in Norwegian and will apparently deal mainly with the historical side of affairs in Svalbard. It may be noted that by Svalbard is meant not Spitsbergen only, but all territories under Norwegian sovereignty in North Polar regions.

The first numbers of the *Meddelelser* have many of them more than merely Norwegian interest. One is a history of territorial claims in Spitsbergen, and another is a carefully written account of recent assertions of sovereignty in the Arctic and Antarctic. Others describe the exploration of the ice-covered interior of South-East Spitsbergen, and a visit to North-East Land in search of members of the Nobile Expedition; the map accompanying the latter gives an entirely new outline to the north coast of North-East Land. No. 7 is a complete history (with bibliography) of Jan Mayen, and No. 8 is an account of summer exploration undertaken between Dickson Bay and Wijde Bay.

The new numbers of the *Skrifter* maintain the same geological predominance as the earlier ones; at least four deal with Mesozoic stratigraphy and palaeontology, others are concerned with the Devonian and Carboniferous, and the longest is an account of the geology and history of Bear Island. All contain sound and interesting matter. Of more general importance however is the record, written by Dr. Adolf Hoel, of the various Norwegian scientific and cartographic expeditions made to Spitsbergen between 1906 and 1926. First initiated by the Prince of Monaco, these visits went on without interruption over a period of twenty years, and were in no small way an indication of the close interest which Norway had already developed in Spitsbergen before her formal ownership was brought about. This is the first complete account of how first Isaachsen, then Staxrud, and finally Hoel himself have gradually developed an intensive exploration of the former "No Man's Land." Bit by bit the whole of the west coast and much of the interior had now been minutely mapped. It is worth noting that the title of the *Skrifter* has been slightly changed; Nordishavet has become Ishavet; and publication is now no longer made by the Norwegian Academy of Sciences, but officially by the Norwegian Ministry of Trade. In general get-up and wealth of illustration the *Skrifter* are more impressive than the *Meddelelser*, but, as has been indicated, the latter are in some ways equally important and in many cases of more interest to the general reader. J. M. W.

EXPLORING ABOUT THE NORTH POLE OF THE WINDS. By WILLIAM HERBERT HOBBS. *New York and London: G. P. Putnam's Sons* 1930. 10×6 *inches;* viii+376 *pages; illustrations and sketch-maps.* $5.00

Professor Hobbs, of the University of Michigan, was led by his studies of glacial geology to formulate a theory of atmospheric circulation depending largely on the chilling effect of a great ice-cap upon the air in contact with its surface. The domed contours of great ice-caps should cause outward downrushes of the chilled air making their centres poles of the winds which in Professor Hobbs' view dominate the movements of the atmosphere from the Antarctic continent in the south and less completely from Greenland in the north. The theory of the glacial anticyclone was not received by meteorologists with much cordiality, but the facts on which it was based remain open to observation and ready to point the way

to a correct interpretation if observed with sufficient care and continuity. Professor Hobbs undertook this work on the lesser and more accessible Pole of the Winds, and the book before us contains a clear and commendably concise narrative of three expeditions which he conducted in Greenland in the summers of 1926, 1927, and 1928, with some account of the work of members of the party who stayed on throughout the intervening winters in order to secure continuous observations.

The book keeps the scientific work well in the background; no details are obtruded to bore the most casual reader, but enough is said to allow the intelligent to catch the compelling motive of much lively experience.

The first expedition was away from America from the end of June to the beginning of September 1926, a direct passage to and from Holstenborg, on the southwest coast of Greenland, being available in a small vessel which several independent parties had combined to charter. In that part of Greenland a belt of snow-free tundra about 100 miles wide stretches between the sea and the glaciers descending from the ice-cap, but a series of long fjords, big rivers, and narrow lakes makes water transport available nearly up to the ice. In the six weeks which the first expedition remained in the field, Professor Hobbs with his able and hardy young colleagues established radio communication with the outside world and carried out ninety observations with pilot and sounding balloons to a height of several miles, in order to find the thickness of the sheet of air descending from the ice-cap and the distance to which it made itself felt.

The two expeditions of the following years were on a more ambitious scale, including the building of an observation hut, with complete radio and aerological equipment in which the observations were kept up both summer and winter for two years. The permanent station was established just within the Arctic Circle near the head of the Söndreström Fjord on a hill about 40 miles from the edge of the Inland Ice. Professor Hobbs was only free to spend the summer in Greenland, and he must have grudged the time required in travelling from Ann Arbor to Copenhagen and thence by the Danish Government supply ship to Greenland, but once there he filled every minute of the time with ceaseless work. In 1927 he was on the spot from the beginning of June to the middle of September, and made one trip to the ice-cap. In 1928 baffling delays and accidents reduced his time at his Greenland base, hampered his work, and called for great efforts to avert disaster. These untoward circumstances however provide a fascinating narrative, culminating in one of the liveliest thrills in modern exploration, when the party from Ann Arbor found and rescued the two American airmen who, in attempting a flight by the northern route to Europe, had descended on the ice-cap and wandered for a fortnight on the tundra. Few more striking contrasts have varied the return of an explorer than that afforded by the shipwreck of Professor Hobbs' party when an Eskimo skipper, falling asleep at the wheel, ran his motor sloop ashore in a desolate fjord, and the reception at Ivigtut ten days later, where the foreign staff of the cryolite shipping concern entertained the Americans to a banquet in their club, where all but the honoured guests appeared in the evening dress of civilization.

Professor Hobbs tells a good story in plain straightforward language, and the publishers have done their part in providing a dignified uncrowded page to which the author adds grace by a series of clever initials and tailpieces from his own pencil.

The results of the meteorological observations cannot be available for some time, and it is doubtful whether they will afford a solution of the problem until they are supplemented by similar records taken on the ice-cap itself and on the eastern coast. Plans are being matured in more than one quarter for investigating

the air conditions over Greenland and the Arctic regions generally with a view to air-transport. Thus, as has happened so often in the history of science, the pursuit of a purely theoretical problem may end in early practical applications. The University of Michigan has given a good lead. H. R. M.

EARLY SCIENCE IN OXFORD. Vol. v. Chaucer and Messahala on the Astrolabe. By R. T. GUNTHER. *Oxford: University Press* 1929. 9×6 *inches;* viii+234 *pages; and facsimiles. Subscription price* 42*s*

Dr. Gunther continues to place students and book-lovers in his debt by his carefully produced series 'Early Science in Oxford,' and the fifth volume, now under review, is one making a special appeal to geographers, since it deals with the foundation Science of Astronomy. The Composition and Use of the Astrolabe are not to be understood without careful and sustained attention, yet Geoffrey Chaucer considered the subject not too difficult for his ten-year-old son Lewis, and since the child's aptitude for science outstripped his Latinity, his father wrote for him an English version of the current exposition of the Astronomer's favourite instrument. It is this version that Dr. Gunther prints in full for the first time, together with the original diagrams, and a rendering into modern English. He adds also, in collotype facsimile, the text of a thirteenth-century MS. of Messahalah from which Chaucer borrowed his material, besides a reprint of the version of this Arab writer's work which formed one of the addenda to Reisch's popular 'Margarita Philosophica.'

Dr. Gunther does not mention that there is a very interesting Tudor MS. edition* of Chaucer's work. This was prepared about 1556 for the young Earl of Devonshire, Edward Courtenay, who spent most of his short life in the Tower, and so solaced himself with books. The editor was Walter Stevins, of whom nothing further appears to be known, and the actual fourteenth-century MS. on which he worked is extant in the British Museum,† with all his marginal notes and emendations of the text. Bound up with several kindred MSS. it formed part of the library of John Pountesse, and is the only copy in the Museum which has the illustrative diagrams: it was, however, considerably shorter than most of the MS. versions, and Stevins was collating it with a second MS. and with a "printed copie" which presents a puzzle. Thus, on fol. 101 of the original he has written in the margin: "Looke whether the first printed copie will help thee in this case or not, for as farre as I can judge bothe these copies (*i.e.* his MSS.) be corrupt. I have mended thother boke (*i.e.* the version for Lord Courtenay) according to xli pro. 2nd (?) parte of Stofflerius." The last reference is to Johan Stöffler's treatise on the Astrolabe, which was printed in 1524, and it is a most interesting coincidence that Dr. Gunther has "mended" his book from the same source, the Tudor and the modern editor alike borrowing Stöffler's illustrations of the measurement of the heights and distances of towers by means of the astrolabe.

Incidentally the treatise clears up a small point that has puzzled investigators, namely, the exact technique of taking a solar observation. Old woodcuts show the astronomer looking directly through the pinholes of the astrolabe at the sun, as he did, of course, look directly at a star or at the moon. Actually, however, he is directed to turn his left side to the sun, and, holding the astrolabe on his right thumb, move the alidade up and down until the sunlight streams through the holes (Part ii, prop. 2).

The difficulty which the average young student of geography finds in mastering even the barest elements of astronomy and of the mathematics of the sphere, and

*Sloane MSS. Cod. 261.
†Sloane MSS. Cod. 314.

the distaste with which the subject inspires him, would certainly vanish if more attention were paid to such delightful early works as this. The older instruments and instrumental methods were necessarily simpler than those of to-day, and consequently their principles are more readily grasped. Once this is done, the enormous complexity of procedure, and the intricate devices that have been introduced to secure a greater and greater refinement of accuracy, are more easily comprehended. The twentieth-century student who lacks mathematical training should seat himself upon the school bench beside little Lewis Chaucer.

E. G. R. T.

HISTORY OF FRENCH COLONIAL POLICY. 1870–1925. By STEPHEN H. ROBERTS. 2 volumes. *London: P. S. King & Son* 1929. 11×6 *inches;* xvi *and* viii+742 *pages; sketch-maps.* 42*s*

Mr. Roberts' work is the first in English to deal on a large scale with the theory and history of modern French colonial development. He shows an extensive knowledge of the documentary sources and writes with much spirit. The general reader may feel the detailed treatment at times overpowering, especially as the method entails a certain amount of repetition, but he should certainly find the first four chapters and the last, which contain a general survey, both profitable and readable.

It has been a commonplace of historical text-books that the French overseas empire has been greatly handicapped by the reluctance of the French to settle abroad. This overlooks the fact that in the only extensive temperate region which the French made a determined effort to colonize, that is, in Eastern Canada, they were successful. Mr. Roberts points out other factors: France re-entered the contest for overseas possessions when the tropics alone presented opportunities for acquisition, under the impetus of the demands of modern industry for supplies of raw materials, and when a stationary population at home made extensive emigration unpopular. This late entry was due primarily to France's continental outlook in politics, a consideration not emphasized by the author. He recognizes that a true comparison can be made only between the French Empire and the British Crown Colonies and Protectorates, yet to some extent his criticisms of French methods are based upon the history of the British Dominions. The outstanding characteristics of French methods are assimilation and centralization, both deriving from the "principles of '89," and an even earlier administrative tradition. Applied overseas, these have resulted, in place of advance by "trial and error," in the setting up of a fixed standard, equally applicable in theory to the inhabitants of the West Indies, Senegal, or Indo-China. It is noteworthy that assimilation does not cause France, as is sometimes asserted, to be more ready than other powers to admit the peoples of her empire to full civic equality: with a few exceptions, Algeria is the sole example of this, and there a large French population is present.

In the final chapter, the contrast between the English and French attitude towards less advanced peoples is skilfully developed, and it is interesting to see how, starting from different standpoints, a common aim in the policy of "association" has been established. Mr. Roberts does not hesitate to point out the weak points and failures in French colonization, but he is equally ready to give credit where that is due. The difficulties in securing adequate labour supplies are not peculiar to France alone. His analysis of the records of other European powers as colonizers is impartial and especially valuable.

The main body of his work consists of separate accounts of each colony, containing a large amount of social and economic as well as historical material. There are many sketch-maps and an extensive bibliography; everything, in fact, has been done to render the book worthy of the importance of its subject. G. R. C.

A BRIEFE HISTORIE OF MOSCOVIA. By JOHN MILTON. With an introduction by PRINCE D. S. MIRSKY. *London: Blackamore Press* 1929. 9×7 *inches;* 120 *pages; woodcuts.* 30*s*

This pamphlet of Milton's throws interesting light upon Anglo-Russian relations in the seventeenth century. It appears to have been written in the thirties of that century, all its material being drawn from the works of Hakluyt and Purchas. Milton, from the statements in his preface, intended it to serve as a model geographical monograph—"The study of Geography is both profitable and delightful: but the Writers thereof, though some of them exact enough in setting down Longitudes and Latitudes, yet in those other relations of Manners, Religion, Government and such like, accounted Geographical, have for the most part miss'd their proportions." He has reduced the accounts of Russia to reasonable compass to save his readers "the far longer travaile of wandering through so many desart Authours." As is natural for a countryman of Chancellor's, he commences his description of Russia at Archangel and works southwards, along the trade route to the Caspian. The concluding chapter gives a detailed account of English travellers and merchants in Russia. Prince Mirsky, in his illuminating introduction, points out that they were the "most reliable and most many-sided" of observers in the seventeenth century, and that until the abrogation in 1649 of the special privileges enjoyed by them (nominally on account of Charles I's execution) the English portion was the most important in Russia's foreign commerce. Two other historical documents are added. There are no notes to the text, and no map: though well printed and ornamented with woodcuts, the price, even for a limited edition, seems somewhat excessive.

COMMENTARIES OF RUY FREYRE DE ANDRADA. Edited with an Introduction by C. R. BOXER. (The Broadway Travellers.) *London: George Routledge & Sons* 1930. 9×6 *inches;* lvi+328 *pages; and illustrations.* 15*s*

One of the learned historical monographs of Luciano Cordeiro, the distinguished Perpetual Secretary of the Lisbon Geographical Society, bore the title 'Como se perdeu Ormuz,' and it was based on the 'Commentaries,' which is a rare volume, even in Portugal. Mr. Boxer has now superseded it by translating the original, with an introduction containing a summary of the military history of the Persian Gulf in the first thirty years of the seventeenth century, and he has printed in twelve appendices important documents about Ruy Freyre and Nuno Alvares Botelho, a fine sea-dog who fought the English and Dutch with success. The main interest of the book lies in the story from the Portuguese side of the capture of Ormuz in 1622 by an Anglo-Persian force, which laid the foundations of our supremacy in the Gulf, and next in the career of Ruy Freyre, a soldier and sailor of untiring energy, of few words and of stern, even cruel, deeds, a representative of the *conquistadores* who established an Eastern dominion stretching from East Africa to the Moluccas and held it, with very slender resources, for over a century against numberless foes. Mr. Boxer gives the complete English account of the siege by an eye-witness, Edward Monnox, which appears in Purchas only in an abridged form, so that we are able to compare the two versions and arrive at a reasonably safe judgment on the operations from the political and military points of view.

The Portuguese shone in the defence of fortresses, as witness the cases of Diu, Malacca, and Colombo, but from a military standpoint they deserved to lose Ormuz, because they made one mistake after another. Though King Philip had ordered him to build a fortress at Kishm, Ruy Freyre should have listened to the reasons against it alleged by the men on the spot; his obstinacy provoked the Anglo-Persian alliance with all its consequences. He did his best to repair the

blunder, for after escaping from an English ship by making his captors drunk, he blockaded Ormuz so closely that its trade was ruined; but in spite of his efforts and those of Botelho, the Portuguese never recovered command of the sea. Simão de Mello, captain of the fortress, committed a gross breach of duty by neglecting to have the moat cleaned out, while the laying up of the fleet under the walls, where the English burnt it, was a crowning act of folly; the crew of the galleon *S. Pedro* gave an example to their superiors by refusing to let her be scuttled, and they went on fighting alone for days. The inaction of the fleet sealed the doom of Ormuz: the Persians could never have taken it without the aid of the English ships.

By a strange fate, Ruy Freyre, who had spent his best years in fighting Infidels and heretics, lies buried at Muscat, in a church which has been profaned and now, according to Mr. Boxer, serves as the residence of an Imam! The fortresses of Muscat and Ormuz exist to show how there, as elsewhere, the Portuguese architects and masons built for all time, and not long ago the latter still contained dismantled cannon, presumably some of the three hundred it possessed when it passed into Persian hands.

The identity of the author of the 'Commentaries' is unknown; if they were really compiled by the publisher, he deserves praise for his stirring narrative, though it is bereft of literary style and, probably by the printer's fault, sometimes obscure in meaning. Mr. Boxer has corrected the mistakes of fact by reference to English and other Portuguese sources, and when a point is doubtful, he decides between conflicting evidence with good judgment; his general impartiality should satisfy foreign readers. He has made a special study of the military activities of Europeans in the East during the seventeenth century, and possesses the unusual advantage of knowing the three languages in which the struggles of Portuguese, English and Dutch are recorded; his notes show intimate acquaintance with the movements of the warships of these nations. The book is handsomely produced and illustrated; it is to be regretted that no protrait of Ruy Freyre seems to have been made or preserved. E. P.

FONDAMENTI DI GEOGRAFIA POLITICA. By LUIGI DE MARCHI. *Padua: A. Milani* 1929. 10 × 7 *inches;* viii + 208 *pages.* 22 *Lire*

In this monograph Prof. de Marchi of the University of Padua considers the influence of physical and human factors, and their distribution, on the formation, rise, and decadence of states. After a brief historical sketch of the development of the modern state, he examines each of the great empires of the present day in succession. The "laws" which he sets forth might perhaps better be described as tendencies. It is interesting to note that a body of people without a definite territory cannot form a state. Here he is evidently thinking of the Italian emigrants in South America and elsewhere. In his discussion of boundaries, he seems to confuse "natural frontier," *i.e.* a frontier formed by natural features, with an ideal boundary for a particular nation.

As might be expected, the State is treated not only as a geographical expression, but also as a corporate entity. In discussing the condition of Italy to-day, he points out that, on account of a growing population and imports from abroad, to keep the nation at work both lower profits and lower wages are necessary, and it is this that justifies the conception of the State's duties now current in Italy. He does not doubt, however, that in a few years Italy will be able to feed herself despite the increasing population, and to dispense with imports.

THE MONTHLY RECORD

DEATH OF DR. NANSEN

On May 13 the Society heard with profound regret that its Honorary Corresponding Member and Gold Medallist, Dr. Fridtjof Nansen, had died that morning at Lysaker. It was known that he had been ill, but hopes for his recovery were justified by his recent acceptance of the invitation to attend our Centenary Celebrations. On receipt of the news a telegram of condolence was sent on behalf of the Society to Madame Nansen, who has returned her thanks. The President represented the Society at a Memorial Service held in London on May 20. The memoir in which we shall attempt to do justice to so eminent an explorer and geographer cannot be hurried: but we should lose no time in expressing to Dr. Nansen's family and friends and countrymen our deep sense of loss.

PRESENTATION OF CULLUM GEOGRAPHICAL MEDAL FOR 1929 TO DR. H. R. MILL

At the Evening Meeting of the Society on Monday, May 19, H.E. the American Ambassador presented the Cullum Geographical Medal of the American Geographical Society to Dr. Hugh Robert Mill, our Vice-President, in recognition of his researches and writings for the advancement of geographical science, especially in the field of physical geography. Dr. Mill, in replying, thanked the American Geographical Society for the honour which they had done him. Concerned as he had always been in searching out the ways of many waters, he was proud to be associated with many earlier Cullum Medallists whose names were eternally linked to the ships which carried them to fame: Nansen of the *Fram*, Murray of the *Challenger*, Scott of the *Discovery*, Shackleton of the *Nimrod*, Bruce of the *Scotia*, Charcot of the *Pourquoi Pas?*, and H.S.H. the Prince of Monaco of the *Hirondelle I* and *Hirondelle II*. Also with such eminent American geographers as W. M. Davis and Miss Ellen Churchill Semple, and, among his own old friends at the R.G.S., Keltie and Reeves. The American Geographical Society had abstained for three years from awarding the Cullum Gold Medal, in order that in the fourth they might, as an international gesture, award it to the representatives of four nations. He was gratified at being associated in the giving of the Medal for 1929 with Brunhes of France, Hettner of Germany and Shokalski of Russia.

THE BEGINNINGS OF THE BRITISH EMPIRE

Mr. R. P. Bishop has sent us some notes on the earliest conceptions of a British dominion beyond the sea, which bring out one or two points which have been, perhaps, somewhat overlooked. In particular he lays stress on the identity of the underlying notion in the terms "Nova Albion," first applied by Drake to the land reached by him on the north-west coast of North America, and the "New England" of the charter of 1620, to which in course of time a more restricted meaning came to be attached than was in the minds of its originators. "Nova Albion (that is to say) New Englande" is already spoken of in Blundeville's Exercises in 1594, the reference being here to the land discovered by Drake, which is shown on most maps of the time in about the latitude of the present Canada–United States boundary: in one it extends roughly from Vancouver to Winnipeg. Some years later, in connection with the proposed renewal in 1622 of the New England Charter, we find, from the Minutes of the New England Council preserved at the Record Office, that "the Country [is] to be called Nova Albion," showing that the two terms were then held to be synonymous. The new patent was to give power to created titles of honour somewhat on the lines of the Baronetcies

of Nova Scotia, so the council had evidently in mind the grant of New Scotland to Sir William Alexander in 1621. In this case too the Latin and English names seem to have been interchangeable.

From this Mr. Bishop argues that the idea of an overseas dominion in America was in men's minds some years before it actually took shape. Even before Drake's voyage the same idea is held to be foreshadowed in the proposal of Sir Humphrey Gilbert (1566) for a "staple . . . about Sierra Nevada" to facilitate trade with the Indies. (Mr. Bishop's views on this point, not perhaps likely to be accepted without question, were put forward tentatively in his article on the Gilbert map in the *Journal* for September 1928.)

The first use of the term "British Empire" goes back to 1576, when it was used by Dr. John Dee, and the Queen seems to have already decided to found an overseas dominion in 1580, when she approved the "Title to North America" which Dee had prepared. To protests of the Spanish Ambassador the reply was made "that other princes may . . . without breach of the law of nations transport colonies thither, where the Spaniards inhabit not, forasmuch as prescription without possession is little worth." The freedom of the seas to all nations was claimed at the same time, in vindication of Drake's presence in the Pacific, for the Queen asserted "that other princes . . . may also freely navigate that vast ocean, seeing the use of the sea and the air is common to all."

CHEMICAL DENUDATION IN SWEDEN

Since 1909 an elaborate series of observations of the Swedish rivers has been made by the Swedish Hydrographic Bureau (now the National Meteorological-Hydrographical Office), a special object being to throw light on the transport of material by the rivers either in suspension or in solution. The result as regards the latter are recorded in detail by J. V. Eriksson in the *Meddelanden* of the office named, vol. 5, no. 3, 1929, which, though mainly in Swedish, contains an excellent summary in French, so that the main outlines are made generally available. The research has necessitated careful observations on the flow of the rivers —in itself a valuable result—and these are briefly summarized in the memoir, together with general geographical and geological details on the individual river-basins. To bring out the full lessons to be learnt the sixty-nine observing stations are divided into five groups according to the nature of the basins concerned: (1) Those composed of moraines and calcareous clays, but slightly wooded; (2) those of similar composition, with extensive forest-cover; (3) plains of clay with small lime-content and little woodland; (4) forest regions with little lime (subdivided according to their extent); (5) alpine basins. In a general way it is found that, in basins otherwise comparable, the amount of inorganic matter in solution decreases in inverse proportion to the area of the basin, the amount of precipitation, and the percentage of run-off. The principal substances held in solution (lime, magnesia, mineral acids, etc.) are considered in turn, the amounts being recorded in tables and illustrated by maps showing their variation in the different basins. As regards organic matter in solution, the amount is highest in the calcareous regions and clayey plains, decreasing in the forested regions proportionally to the extent of the basins, evidently owing to oxidization phenomena (studied in a special section). The amount is least in the alpine regions. Periodic variations are also discussed, the content of inorganic matter being generally highest at low stage and lowest in flood, while the reverse holds generally for the organic. The absolute amounts of dissolved matter have been calculated in tons per year per square kilometre. Distinctly calcareous regions show high values, reaching a maximum of 70 tons, while the highest figure for forested regions is 20 tons, with an average of about ten. In the alpine regions the amount again

rises. The geographical distribution of these quantities is illustrated by maps. Finally, the results now available for Sweden are compared with those for other countries where similar observations have been made. Baulig's work in America has shown that in areas originally glaciated chemical denudation reaches from 87 to 96 per cent. of the total, while in the Mississippi basin it ranges between 13 and 46 per cent. On the plain of Central Europe it reaches 80–90 per cent., but in the Upper Rhone basin only 23 per cent., by reason of the low value during high water. The Swedish figures are not altogether reliable for the matter in suspension, but it seems probable that from 70 to 90 per cent. of the total denudation is caused by chemical action.

CHANGES IN THE RHONE DELTA

Mr. R. D. Oldham, who a few years ago published in *Nature* some conclusions as to movements of the crust in the Rhone delta within historic times, has continued his researches and been able to collect further evidence of such changes both by examination of the ground and by study of old records. The new results are summarized in *Nature* of 19 April 1930 in an article illustrated by sketch-maps. (It will be remembered that Mr. Oldham discussed the evidence of the early portolan maps in a paper read before this Society in 1925; *Journal*, 65, pp. 403 *et seq.*) In Roman times the main mouth seems to have been at the Grau de la Dent, the river having taken a course nearly due south from below Arles, west of that of the present Grand Rhone. About the close of the twelfth century the main entrance navigation channel was farther east at a place known as Odor, whence a stretch of lagoons led to Passon, a single narrow channel then giving passage to a wider one coming from Arles by the line of the present Grand Rhone. Mr. Oldham points out that the narrow passage between two wide stretches of water could only have originated through a general subsidence which opened a channel or channels across the strip of higher ground known as the Plan du Bourg. This gives a means of estimating the amount of the subsidence, as the lowest part of the bed must in Roman times have stood above the flood-level, or about 2·75 m. above the sea, while later it was about the same amount below, giving a total change of something near 6 m. The evidence of Roman structures at Arles had indicated a change of not over 5 m., but the unusually low water of last October permitted further examination of the remains, and showed that there the change had been quite 6 metres, possibly more. This subsidence caused large areas to sink below the sea, permitting the river rapidly to extend its delta over the shallow waters, and many were the disputes over the ownership of the new lands, maps being made to illustrate the rival claims. A study of the records shows the main movement to have taken place within the eighth century between long periods of little or no change. A small downward displacement appears to have occurred in the eighteenth century, whilst one comparable to that of the eighth, about 1000 B.C., is deducible from the 'Ora Maritima' of Avienus (based on a Greek periplus of about 600 B.C.), which speaks of a great marsh occupying the position in which one existed in the Middle Ages, though it dwindled in the interval. Thus during the last 3000 years the movement has been always downward, but limited to three special periods. Further research is needed to prove whether these movements were or were not limited to the delta region.

SUMMER CURRENTS IN BAB-EL-MANDEB

Recent Italian investigations in the Red Sea have helped to extend our knowledge of the physical condition of the waters, especially with regard to the currents. The work of the *Ammiraglio Magnaghi* in 1923–24 (see *Journal*, 73, p. 487) shed light on the régime of the currents during the winter half-year

(October to May), when a surface current flows from the Gulf of Aden towards the Red Sea with an under-current in the reverse direction. According to the British Admiralty pilot and previous Italian observations the position appeared to be reversed during the summer monsoon, but this was not fully established, and last summer further researches were undertaken both by the *Magnaghi* and two other vessels. Conditions were not altogether favourable, but some useful data were secured, which are summarized by F. Vercelli in the *Atti* of the R. Academia dei Lincei, vol. 10, fasc. 10. It is found that in the lower basin of the Red Sea there are in summer three distinct superposed water-strata, with different physical characters and different directions of movement. Down to about 30 m. the water is moving slowly towards the Gulf of Aden, both temperature and salinity being almost uniform (the former varying between 31° and 30° C.). Between about 40 m. and 150 m. the movement is towards the Red Sea, and is fairly rapid in the upper and middle layers. The water is typically oceanic and the temperature varies from 20° C. to about 17°, thus showing a drop of 10° within a vertical interval of 10 m. Below 150 m. the movement is again outwards, the water being typical of the bottom layers of the Red Sea, with high temperature (as high as 22·5° C.) and salinity. The intermediate layer is derived from greater oceanic depths, being lower in temperature than the corresponding layer outside the strait, and the paradox is noted that between 40 m. and 150 m. the water is 4°–5° colder in summer than in winter. The direction of the surface current is attributable to the fact that the drift due to the monsoon overbears the opposite tendency due to difference of density and of level caused by evaporation.

CALIFORNIAN COASTAL FOGS

The Summer Sea Fogs of the Central California coast are discussed by Horace R. Byers (*University of California Publications in Geography*, vol. 3, no. 5). These fogs, which are of almost daily occurrence, are not only a hindrance to marine navigation but a serious menace nowadays to aerial navigation along this mountainous coast, demanding an elaborate forecasting service. The fogs form some distance out at sea on the surface as a result of the chilling of the saturated air currents by the cold water along the coast. The winds in summer on the coast of California are almost constantly from north or north-west in connection with the development of the Pacific high-pressure system. These winds produce a sea-drift away from the coast with the consequent upwelling of cold water, which is the determining condition of the fogs. As the fog is carried landwards by the prevailing wind it tends to rise, and at San Francisco very commonly takes the form of "high fog" or low stratus cloud rather than actual surface fog. The summer climate of the San Francisco coast is rendered highly anomalous by the shutting out of the sun by the fog and by the sea winds blowing off unduly cold water. Both factors combine to keep the mean temperature in July well below 60° F., whereas within a comparatively few miles inland in the Central Valley of California it is over 80° F. This extraordinarily steep thermal gradient greatly enhances the persistence and strength of the north-westerly winds along the coast (deflected through the Golden Gate and other gaps as west winds), which thus partake of a monsoonal character. Hence we have the paradox that the chilly weather conditions along the coast are partly a result of the intense heat of the interior. That this is so is shown by the fact that as soon as the land begins to cool down in September the mean temperature at San Francisco rises, and the autumn and early winter months are warmer than midsummer, September being the warmest month in the year, October warmer than August, and even the low-sun month of November warmer than July. This is one of the most anomalous climatic features in the world, though its actual significance is reduced by the

small range of temperature, only about 6° F., between the warmest and coldest months.

The study under notice discusses in some detail the distribution of the fog in regard to altitude and relief, which is very important in connection with aircraft. Usually the wet fogs are preceded and succeeded by dry haze, and the latter generally interferes with surface visibility even when the true fog is "high."

THE GREAT BAHAMAS BANK

Mr. Maurice Black, of Trinity College, Cambridge, recently set sail with an American expedition to investigate the geology of the Great Bahamas Bank (*Discovery*, March 1930). The Bank is a region of special geological interest as representing the only part of the world where limestone deposits are being formed of a character analogous to the great limestone deposits of past geological ages which were formed in shallow seas, and to-day cover a considerable proportion of the land surface of the globe. Most of the shallow-water limestones in modern seas are associated with coral, but on the western part of the Great Bahamas Bank is a great spread of limestone ooze which has nothing to do with coral reefs. The peculiar conditions in the Bahamas, characteristic of Palaeozoic times, are considered to be due to the isolation of the islands from continental land, together with their low relief and the complete absence of volcanic phenomena.

River erosion is practically absent, and there are no streams except on Andros island, where they have practically no fall. Thus the only rocks that can be produced are such as can be made by precipitation from sea-water, and of these limestone is the most important.

Mr. Black gives an account of a reconnaissance expedition across the Bank, which set out in a motor boat from the coast of Florida. The edge of the Bank forms a broken rampart of jagged rocks and cays washed by the deep inky blue water of the Gulf Stream, but inside the girdle of islands the water is pale blue and shallow.

The islands passed were practically bare of vegetation except the larger ones, and lie in the track of the hurricanes which have such evil repute in Florida. After cruising along the western edge of the Bank for about 35 miles the party turned inside the girdle of islands, and steered across the shallows for Williams Island. As they proceeded the sea became paler and paler, passing from enamel blue to light green and then milky white. Finally, on approaching Williams Island on the west coast of Andros, which is only 3 or 4 feet above high-water mark, they had to wade through a white sticky mud. Mr. Black records that the abrupt little cliffs of this island, about 4 feet high, are amongst the strangest sights he has seen, and that it was some time before he realized that he was looking at a tiny reproduction of our English chalk cliffs: headlands such as Flamborough or Beachy Head reduced to heights measurable in inches, and a whole coast in miniature, with tiny bays and coves, little beaches and diminutive waves washing up dazzling white sand. The white chalky mud is termed "drewite," after Mr. C. H. Drew, who came to the conclusion that it was precipitated from sea-water through the action of bacteria. It is believed on good grounds that some of the great limestones, like the Chalk and Carboniferous Limestones, originated in mud similar to drewite, but how this soft buttery ooze is converted into solid rock is a problem which the new expedition hopes to solve. Much of the mud consists of arragonite, and it is suggested that its conversion into solid rock is associated with recrystallization into calcite. A belt of sand occurs seaward of the drewite, whilst the rock which builds the outer cays of the Bank appears to be a wind-blown deposit, the chain of islands being the relic of a complete girdle of sand-dunes once surrounding the Bank. No deep boreholes have as yet been

made into the foundations of the Bank, whose structure still remains a mystery, but it is suspected that they consist of comparatively young sedimentary rocks.

ROCK-WEATHERING IN AUSTRALIA

In the *Geological Magazine* (March 1930), Dr.W. G. Woolnough, in an article entitled "The Influence of Climate and Topography in the Formation and Distribution of Products of Weathering," deals with a type of rock surface due to chemical weathering *in situ* present over a large part of Australia, basing his deductions on personal observations from all parts of that continent. Whereas in regions of immature topography mechanical abrasion almost entirely masks chemical weathering, in regions of nearly complete peneplanation, where run-off of rainfall is very sluggish, the reverse is the case. Very widely distributed in Australia are remnants of what was once in all probability a continuous sheet of chemically formed rock material, very variable in composition and thickness, resting upon a thick substratum of intensely leached bed rock.

Dr. Woolnough believes this widespread capping in Australia, which he calls the "duri-crust," to have been formed throughout the continent during a period of nearly perfect peneplanation, about Miocene in age, and in a climate marked by a dominantly seasonal rainfall. A very definite relationship can be traced between the composition of the crust and that of the underlying bed rock. In climates marked by "seasonal" rainfall capillarity brings to the surface during the dry season solutions found in the subsoil during the wet season. Chemical changes in the surface layers during the dry season result in colloidal silica, alumina, and iron oxide being precipitated in forms insoluble in the water falling during the wet season, and these eventually give rise to the duri-crust. At the present time in Australia there are areas partially covered by duri-crust which are subject to great aridity, and here the duri-crust is being denuded and is not in process of formation. In desert conditions the saturation of the rocks is never complete, even under conditions of advanced peneplanation, so that the complete leaching of subjacent formations does not occur. But in Australia there is good evidence that the present era was preceded by a Pluvial period, perhaps the equivalent of the Glacial period of high latitudes, and there is a strong probability that formations like the duri-crust in areas now arid may be residual. In other areas duri-crust formation may still be in progress, but round the edges of the central plateau stream erosion is actually removing the hard crust. Duri-crust, resting as it does on a soft decomposed substratum, crumbles away in picturesque ruins, producing characteristic types of Australian scenery.

In regions, such as Western Europe, of well-distributed moderate rainfall, conditions of approximate peneplanation favour ordinary soil formation, which has thus come to be regarded as the normal type. But Dr. Woolnough considers that there is strong presumption that the "abnormal" Australian conditions were normal in Europe during such geological epochs as the Old Red Sandstone, Permian, and Triassic. At any rate, he believes that the consideration of the phenomena in Australia may help geologists in other countries to a better understanding of some of the anomalous and puzzling formations of the geological record.

DUTCH OCEANOGRAPHICAL EXPEDITION

In August 1929 we gave some account of the projected Dutch Expedition for research in the Malay Archipelago, for which a special ship, the *Willibrord Snellius*, was built at Rotterdam. The voyage out was successfully accomplished, and the main work of the expedition began towards the end of July, when the ship left Surabaya to undertake the examination of the deep basins of the eastern

part of the Archipelago. A summary of the operations down to September 23 is given in the first number for 1930 of the *Tijdschrift* of the Royal Netherlands Geographical Society. The first two cruises were made in the Strait of Makassar and the waters to the north as far as the Sulu Sea. During her zigzag course the ship stopped for several hours at a number of stations for the study of the sea-water and bottom deposits, while biological hauls were also made. In the intervals echo-sounding was carried on and samples collected from the surface layers. As a strong current was experienced in the narrow sea between Borneo and Celebes, the ship anchored at a depth of 2200 m. in order to secure more accurate results than could have otherwise been obtained. At a station in the Sulu Sea the work of collecting samples occupied eleven hours, the lowest instrument being at a depth of 4400 m. The communication gives details as to the method of working and some of the conclusions arrived at. At each station the depth was fixed by the sounding line and a whole series of samples taken at different depths—near together in the upper strata and more widely spaced at greater depths, and the analyst was kept hard at work examining them as soon as secured. The results at the different stations were combined into a longitudinal profile, and an instance is given of the way in which this may be used to determine the movement of water from one basin to another. Actual measurements of currents were made at the anchoring-place above referred to, and in the Sibutu Strait between the Sulu and Celebes seas, the result in the latter case being to show that the principal movement is from the former to the latter. In both basins the temperature and salinity appear to be uniform below a given depth. The samples of bottom deposits showed considerable variety, including blue mud, non-calcareous deep-sea ooze, coral sand, volcanic mud, and Globigerina ooze. The last was unexpectedly found in the Sulu Sea at several stations with depths greater than 4000 m., it having been previously thought that non-calcareous deep-sea ooze occupied all the bottom below that depth. Stratification in the sediments was rarely noted, but was very pronounced in the Globigerina ooze, some ten separate strata occurring in the space of half a metre. Work on land was occasionally done by the geologist and biologist. A postscript gives some details about later cruises in the more eastern waters, which yielded some valuable results as to the submarine relief, showing that existing charts need correction.

WATERPROOF MAPS FOR USE IN THE FIELD

The Ordnance Survey are bringing out a series of combined sheets of the 1-inch-to-the-mile map of special districts of England and Wales printed on a paper treated by a new process which renders it waterproof besides being remarkably tough and durable. This is known as Places' Waterproof Paper, and it should be a boon to all those who have to use maps in the open during wet weather; for all who have had experience of this know to what a dreadful condition ordinary paper maps are reduced after they have been handled in the rain. It is claimed that this new paper is not damaged by wet, and a map printed on it, after being run over by a car and covered with mud, when scrubbed with soap and water and ironed, was as good as before. The Middle Thames sheet has been forwarded to this Society, where its waterproof character and durability were thoroughly tested, with a result that the claim made seems quite justified. This sheet includes the valley of the Thames and adjacent country from Richmond to about 3 miles beyond Wallingford. The price, folded for the pocket, is 4*s.* net.

CORRECTION OF REVIEW

The reviewer of Henri Baulig's 'Le Plateau Central de la France et sa Bordure Méditerranéenne' (*G.J.*, 75, 1930, pp. 359–362) has asked us to state that the author has written to him pointing out that he was in error in saying, "A

sheet of twenty-nine geological sections of the Plateau shows selected heights but gives no indication of the identity of peneplanes, no geological key, and no map of section lines." The explanations of the sections are given in the text near the end of the work (pp. 580–583), after the titles of the plates, and the courses of most of the sections are shown by thin red lines on the six maps, scale 1 : 200,000, where the geology is overprinted in red. There is no mention of them however in the list of conventional signs at the bottom of each sheet, the only reference to them being on p. 580.

OBITUARY

GEORGE GOUDIE CHISHOLM, M.A., LL.D.

We record with regret the death of Dr. G. G. Chisholm on February 9 last, in his eightieth year. He had been a Life Fellow of the Society since 1884, and was awarded the Gill Memorial in 1903. Born in Edinburgh and educated at the University, he spent several years as a University Extension lecturer in London. By that time he had published the work with which his name will chiefly be associated—his 'Handbook of Commercial Geography,' 1889. The permanent value of this work was attested by the appearance of the eleventh edition in 1928. He also edited 'Longmans' Gazetteer of the World,' 1895. When the university status of geographical studies was first recognized in Scotland by the establishment of a Lectureship in Geography at the University of Edinburgh in 1908 Chisholm was selected for the post, which he held until 1921, when he became the first Reader. Dr. Chisholm also devoted much of his time to the service of the Royal Scottish Geographical Society, of which he was secretary for fifteen years. He was also President of Section E Geography of the British Association in 1907, when he delivered an address upon "Geography and Commerce." In his later years he was particularly interested in problems for which he coined the phrase "economic ethnography." This concerns itself with the effects of racial and national standards and rivalries upon the total welfare of the world, particularly in hindering, or advancing, the attainment of a maximum population. His views and general attitude are stated clearly in his Herbertson Memorial Lecture—"The Goal of Commerce," wherein he defines it as the enjoyment of "the greatest possible variety of commodities supplied at the least cost and with the greatest attainable stability of prices." He sets out impartially the obstacles in the path, but rebuts the charge of over-sanguineness, being convinced that world opinion will come to demand restriction of population and the raising of the standard of life for the less advanced races. The international aspect of this problem he dealt with in a paper on "World Unity" contributed to the *Geographical Review* in 1927.

Dr. Chisholm's work for the advancement of geography was recognized by many bodies, both European and American; among his distinctions being the Daly Gold Medal of the American Geographical Society and the Culver Gold Medal of the Chicago Geographical Society.

T. ALEXANDER BARNS

We very much regret to record the death of Mr. T. Alexander Barns, who was killed in Chicago on the 5th of March by a motor accident. Mr. Barns was well known to the scientific world as a big game hunter and a collector,

especially of butterflies. But his tastes were wide, and he had a true instinct for geography. It was his useful practice before setting out on a journey to Africa to call at the House of the Society and inquire of the Secretary whether there were any subjects of geographical inquiry he might usefully pursue without taking him too far from his proposed itinerary. And as a result of these inquiries he published several valuable papers in the *Geographical Journal*, notably those on "The Highlands of the Great Craters, Tanganyika Territory" (58, 1921, pp. 401–416), "The Mokoto Lakes, Western Rift Valley" (59, 1922, pp. 356–363), and "In Portuguese West Africa: Angola and the Isles of the Guinea Gulf" (72, 1928, pp. 18–37). He had travelled very widely in tropical Africa, and his extensive collections made largely for Mr. Joicey are destined, it is understood, for the Natural History Museum, in which he has been for some years represented by the great African Elephant which stands in the Entrance Hall. His death by accident in the prime of life is a loss to science.

MEETINGS: SESSION 1929–1930

Twelfth Evening Meeting, 5 May 1930. The President in the Chair

Paper: The Oxford Expedition to British Guiana. By Major R. W. G. Hingston

Elections: Joseph Clegg, M.R.S.T., M.I.H.; Mrs. Stephen Courtauld; Oswald I. Ellis; Raj Kumar Fateh Singh of Alirajpur; John A. Jenkins; Miss Helen MacMahon, B.A.; Arthur Nicholls; Lieut. Conrad Franklin Rawnsley, R.N.; Douglas C. Robyns; Herbert Roy Wardill, P.A.S.I.; Everett Pepperill Wheeler, M.S.; Leslie Arthur Willmott, M.B., B.S., M.R.C.S., L.R.C.P.

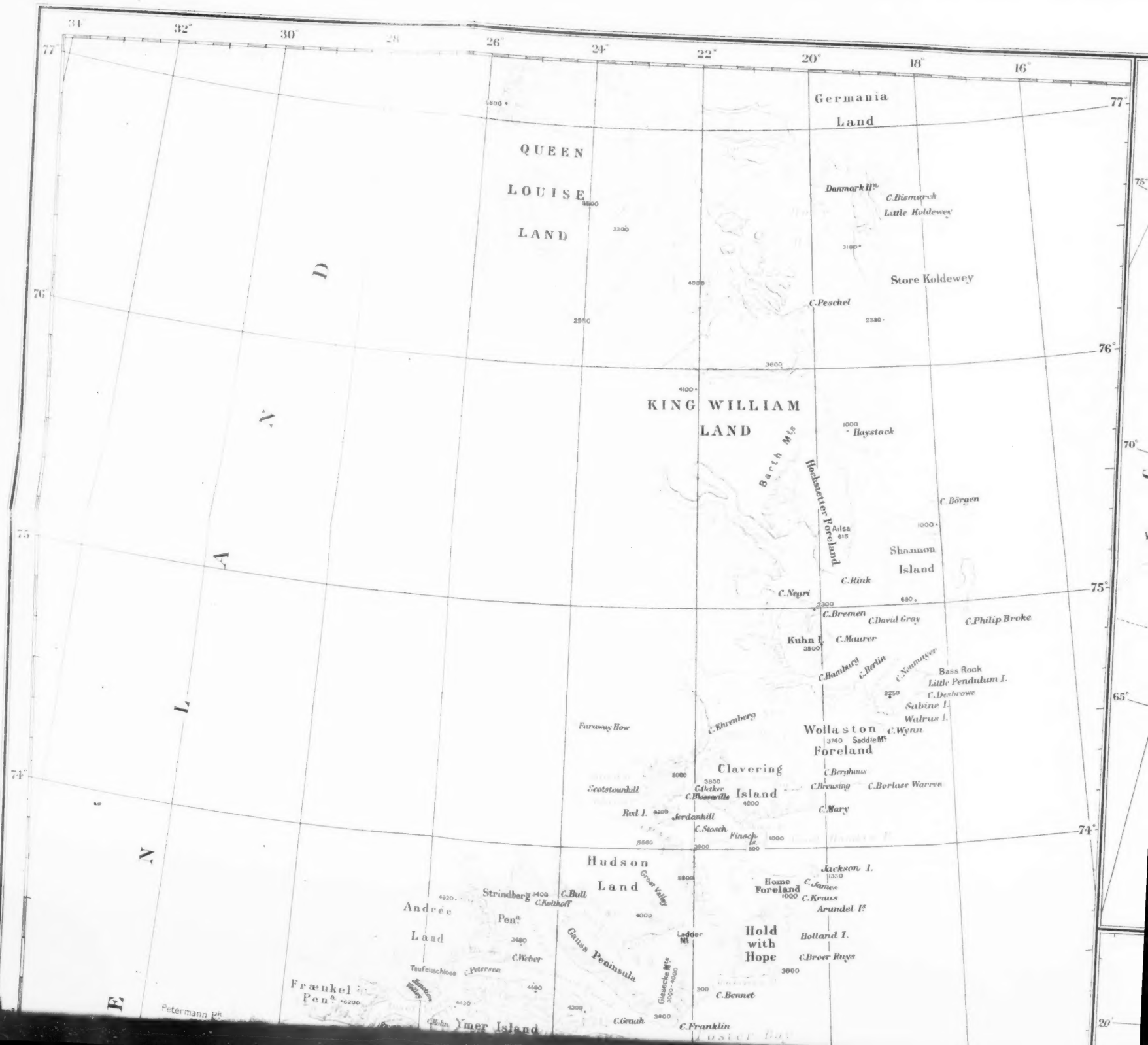
Sixth Afternoon Meeting, 12 May 1930. The President in the Chair

Discussion on Nomenclature in the Himalaya, opened by Major Kenneth Mason

Thirteenth Evening Meeting, 19 May 1930. The President in the Chair

Paper: Journeys in the Tien Shan. By Lieut.-Col. R. C. F. Schomberg

Elections: M. L. Agarwala, B.A., B.ED.; Mrs. Janette Frances Agnes Graeme Batten, M.D.; W. Bosshard; George Henry Costigan; Miss Edith Cherry-Garrard; Robert Cecil Daly, F.R.E.S.; E. N. Eyo; Robert Wilbraham FitzAucher; Jervis Charles Morgan Gubbins; David Kee, F.R.E.S.; The Lady Nina Knowles; The Thakor Saheb of Limbdi, K.C.I.E.; Mrs. Margaret McLaughlan; The Rev. Samuel A. B. Mercer, D.D.; Lieut.-Col. William Merrick; The Rev. Leslie B. Neale; Abel Mageed Omar Bey, M.SC., A.M.INST.C.E., A.M.I.MECH.E.; William Dudley Mackay Price; Rana Bodh Jung Bahadur; Mrs. Pauline S. Stock; Lieut.-Col. E. W. Thistlewayte; Miss Florence Phillis Tomlinson; H.H. Maharaja Mani Rya Bahadur of Tripura; Sydney Upton


Germania Land
QUEEN LOUISE LAND
Danmark Hr.
C. Bismarck
Little Koldewey
Store Koldewey
C. Peschel
KING WILLIAM LAND
Haystack
Barth Mts
Hochstetter Foreland
C. Börgen
Ailsa
Shannon Island
C. Rink
C. Neyri
C. Bremen
C. David Gray
C. Philip Broke
Kuhn I.
C. Maurer
C. Hamburg
C. Berlin
C. Neumayer
Bass Rock
Little Pendulum I.
C. Desbrowe
Sabine I.
Walrus I.
Faraway How
C. Ekrenberg
Wollaston Foreland
C. Wynn
Saddle Mt
Clavering Island
C. Beryhaus
C. Breusing
C. Bertaux Warren
C. Mary
Scotstounhill
C. Bossekop
Red I.
Jordanhill
C. Stosch
Finsch I.
Hudson Land
Jackson I.
Home Foreland
C. James
C. Kraus
Arundel Pt
Strindberg
C. Bull
C. Kolthoff
Andrée Land
Pen.a
Ladder Mt
Hold with Hope
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C. Weber
C. Petersen
Taufelschloss
Gauss Peninsula
Giesecke Mts
Fraenkel Pen.a
C. Bennet
C. Grauh
C. Franklin
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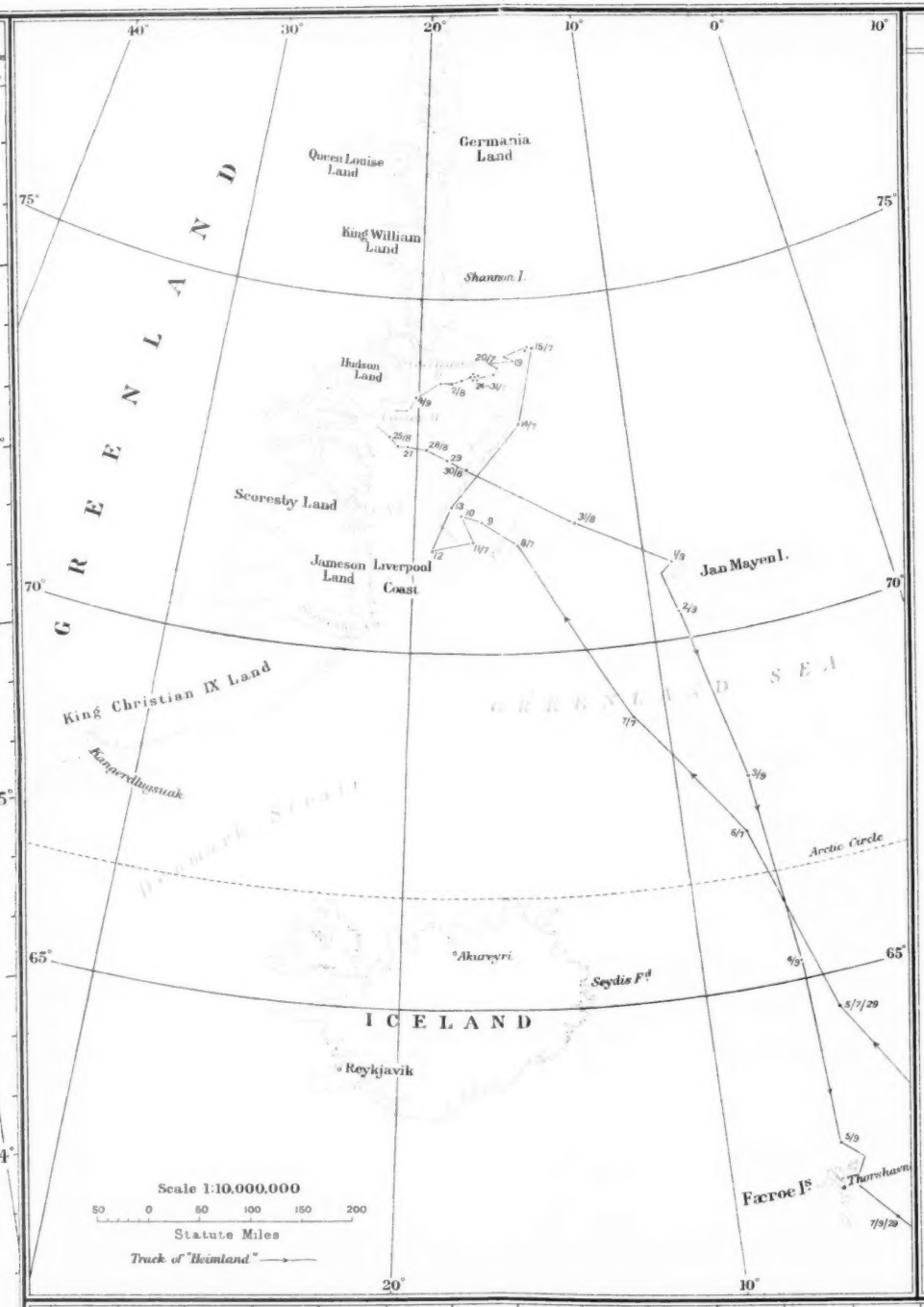


The Coast Region of

EAST GREENLAN

between

SCORESBY SOUND AND DANMARK

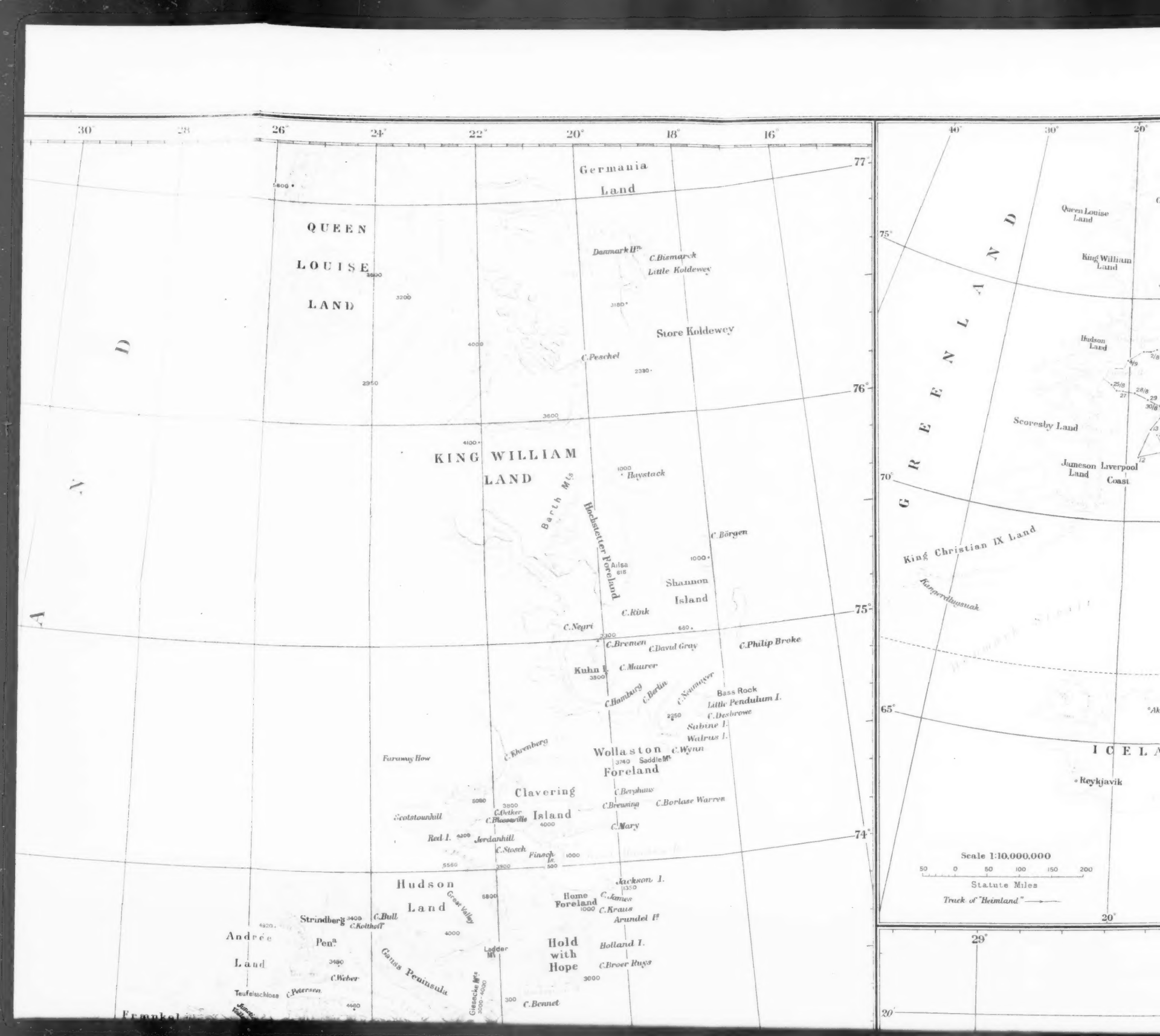
From surveys of the Cambridge Expeditions 1926 and 1929 under the direction of J. M. Wordie and the mapping of other explorers

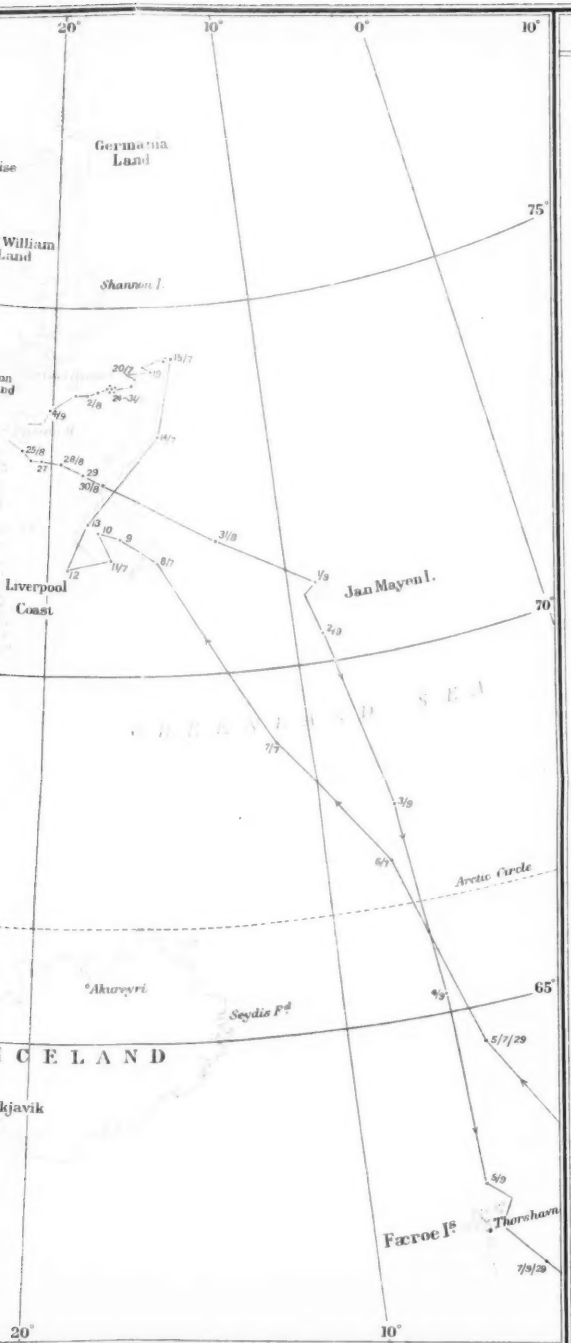
For information concerning the survey work see Appendix I to Mr Wordie's paper, "Geographical Journal", June 1930

29° 30° 28° 30°

20'

NORDENSKIÖLD GLACI


Germania Land
QUEEN LOUISE LAND
KING WILLIAM LAND
Store Koldewey
Danmark Hn.
C. Bismarck
Little Koldewey
C. Peschel
Haystack
Barth Mts.
Hochstetter Foreland
C. Börgen
Ailsa
Shannon Island
C. Kink
C. Negri
C. Brewen
C. David Gray
C. Philip Broke
Kuhn I.
C. Maurer
C. Hamburg
C. Berlin
C. Neumayer
Bass Rock
Little Pendulum I.
C. Desbrowe
Sabine I.
Walrus I.
C. Bismarck
C. Wynn
Faraway How
Wollaston Foreland
Saddle Mt.
Clavering Island
C. Berghaus
C. Brewing
C. Borlase Warren
C. Mary
Scotstounhill
C. Stosch
Pinnoch Is.
Red I.
Jordanhill
Hudson Land
Great Valley
Jackson I.
Home Foreland
C. James
C. Kraus
Arundel Is.
Strindberg
C. Bull
C. Kottwitz
Andrée Land
Penck
Ladder Mts.
Hold with Hope
Holland I.
C. Broer Ruys
Ganss Peninsula
C. Weber
Teufelsschloss
C. Petersen
Giesecke Mts.
C. Bennet
Frankel
GREENLAND
Queen Louise Land
King William Land
Hudson Land
Scoresby Land
Jameson Land
Liverpool Coast
King Christian IX Land
Kangerdlugsuak
ICELAND
Reykjavik
Scale 1:10,000,000
Statute Miles
Track of "Heimland"



The Coast Region of

EAST GREENLAND

between

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From surveys of the Cambridge Expeditions 1926 and 1929 under the direction of J. M. Wordie and the mapping of other explorers

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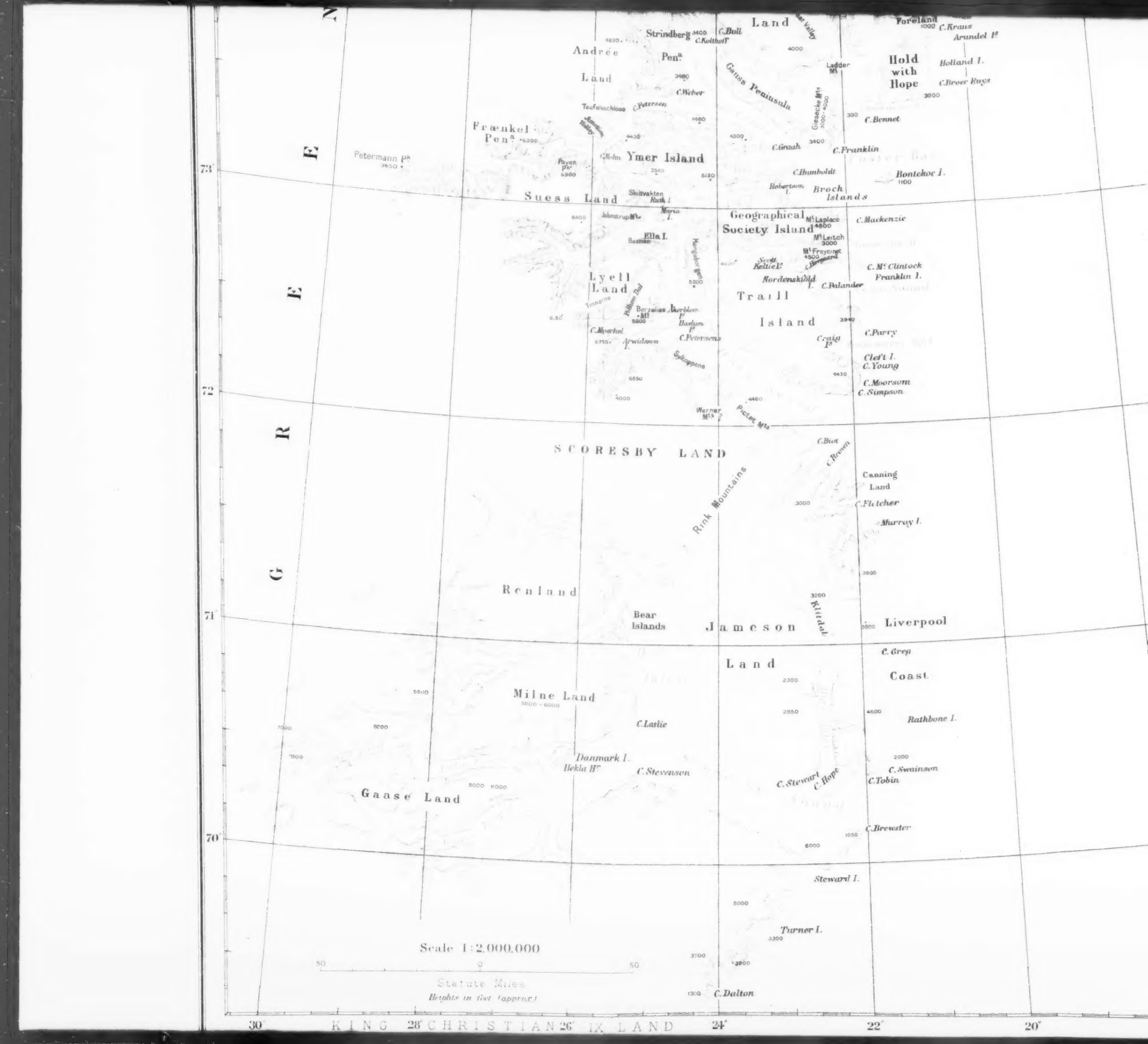
NORDENSKIÖLD GLACIER


Land
Strindberg
C.Bull
C.Kolthoff
Andrée Land
Pen.a
Ladder Mt.
Hold with Hope
Holland I.
C.Bennet
Gauss Peninsula
C.Franklin
Frænkel Pen.a
Petermann Pk.
Ymer Island
C.Humboldt
Bontekoe I.
Broch Islands
Suess Land
Geographical Society Island
C.Mackenzie
Ella I.
Lyell Land
C.Mc Clintock
Franklin I.
Nordenskiöld
C.Bulander
Traill Island
C.Parry
Cleft I.
C.Young
C.Moorsom
C.Simpson
SCORESBY LAND
Rink Mountains
Canning Land
C.Fletcher
Murray I.
Renland
Bear Islands
Jameson Land
Liverpool
C.Greg
Coast
Milne Land
C.Laslie
Rathbone I.
Danmark I.
Hekla Hr.
C.Stevenson
C.Swainson
C.Tobin
C.Steward
C.Hope
Gaase Land
C.Brewster
Steward I.
Turner I.
C.Dalton
Scale 1:2,000,000
Statute Miles
Heights in feet (approx.)
KING CHRISTIAN IX LAND
73°
72°
71°
70°
30°
28°
26°
24°
22°
20°

NORDENSKIÖLD AND PETERMANN

From a survey by R.C. Wakefield
supplemented by photog

Scale 1: 250,000

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Statute Miles

Heights in feet, instrumental
" " " estimated

Nathorst Pk (8480)

Petermann Pk 9650

Little Petermann (8400)

Camp 7

Camp 6

Camp 8

Monte Silvio (7650)

Riddarborgen 5906

Camp 1

Cambridge 7155 / 6680

Peaks 7547 / 7440 / 7300

Camp 2

Lion Bastion (7600)

Camp 5

Battlements

Camp 4

Knuckle (6020)

Sentinel 7900

Camp 3

The Knoll 7280

Outlook Col (7460)

Outlook Pk 7885

Snow Dome 7530

Mt Lauge Koch 8295

Mountainous region
6000 to 8000 ft

The main glacier rises gradually southward up to the inland ice throwing off numerous branches westward.

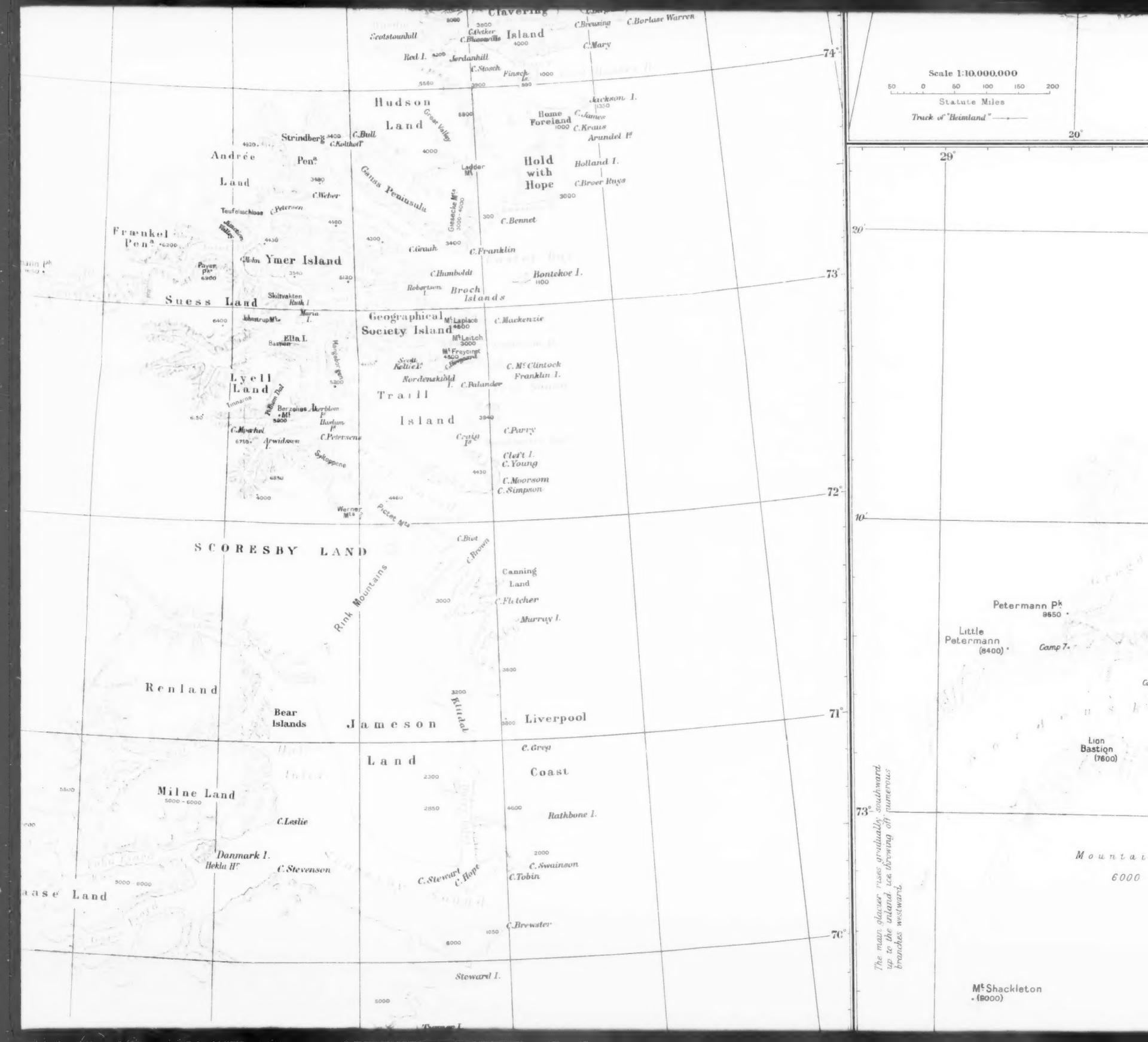
Mt Shackleton (9000)

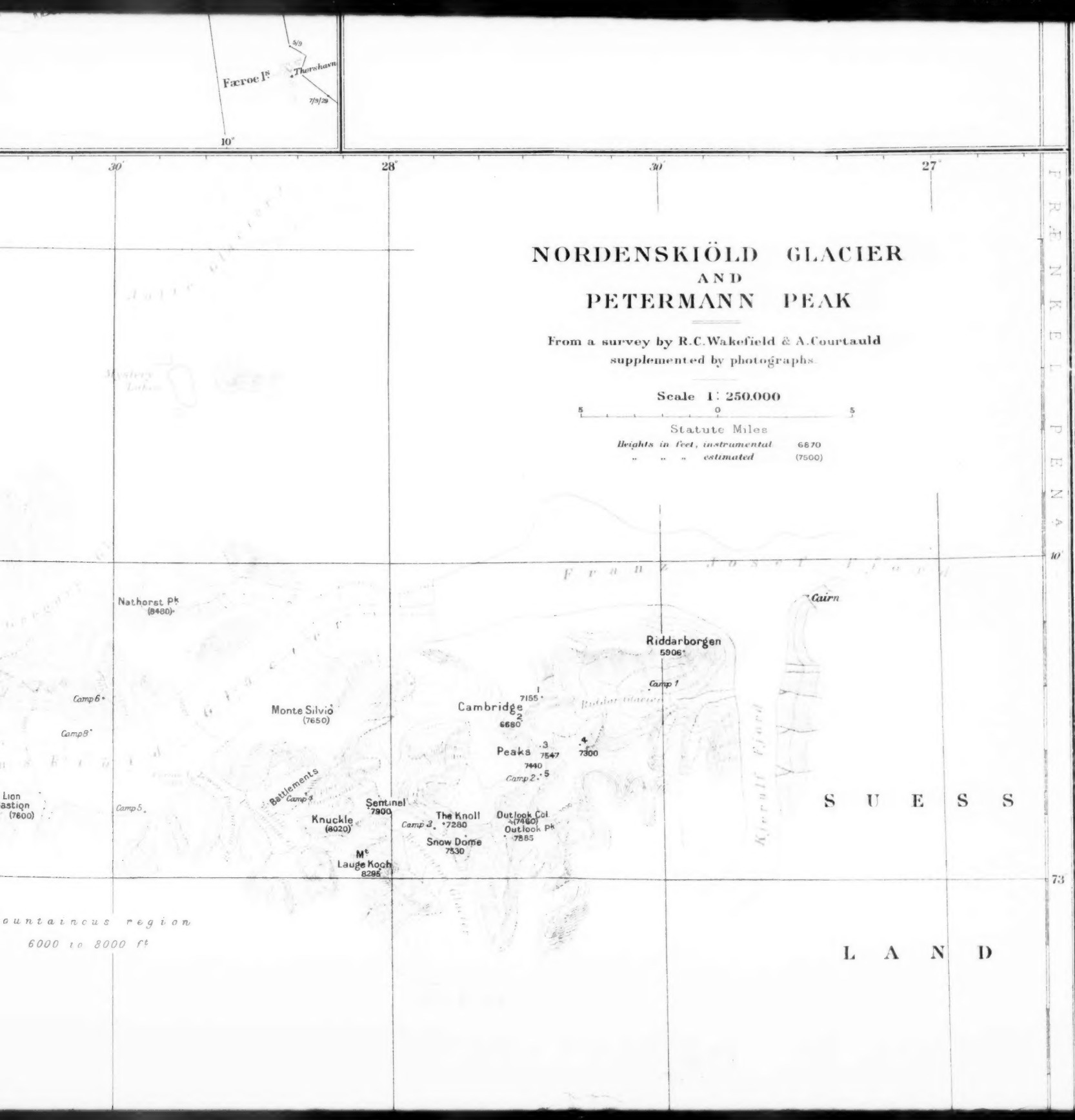
20° 10°

29° 30° 28° 30°

73° 72° 71° 70°

20' 10'


Clavering
Island
C. Breusing
C. Borlase Warren
Scotstounhill
C. Oetker
C. Bluecastle
C. Mary
Red I.
Jordanhill
C. Stosch
Finsch Ie.
74°
Hudson
Land
Great Valley
Jackson I.
Home Foreland
C. James
C. Kraus
Arundel Pt
Strindberg
C. Bull
C. Kolthoff
Andrée
Land
Penk
Ladder Mt
Hold with Hope
Holland I.
C. Broer Ruys
Gauss Peninsula
C. Weber
Teufelschloss
C. Petersen
C. Bennet
Fraenkel Penk
Ymer Island
C. Giraud
C. Franklin
C. Humboldt
Bontekoe I.
73°
Robertson I.
Broch Islands
Suess Land
Skitvakten
Ruth I.
Maria I.
Geographical Society Island
Mt Laplace
C. Mackenzie
Mt Leitch
Ella I.
Bastion
Mt Freycinet
C. Mc Clintock
Franklin I.
Scott Keltie Pk
Nordenskiöld I.
C. Palander
Lyell Land
Traill
Island
Berzelius Mt
Iberblom P.
Hadrum P.
C. Parry
C. Peterssens
Arwidsson I.
Craig P.
Cleft I.
C. Young
Skloppene
C. Moorsom
C. Simpson
72°
Werner Mts
Pictet Mts
SCORESBY LAND
C. Biot
C. Brown
Canning Land
Rink Mountains
C. Fletcher
Murray I.
Renland
Bear Islands
Jameson Land
Liverpool
Coast
C. Grey
Milne Land
5000 - 6000
C. Leslie
Danmark I.
Hekla Hk
C. Stevenson
C. Stewart
C. Hope
C. Swainson
C. Tobin
Rathbone I.
C. Brewster
70°
Steward I.
Scale 1:10,000,000
Statute Miles
Track of "Heimland"
20°
29°
20'
10'
73°
Petermann Pk
8650
Little Petermann
(8400)
Camp 7
Lion Bastion
(7600)
The main glacier rises gradually southward up to the inland ice throwing off numerous branches westward.
Mt Shackleton
(8000)


Færoe Is
Thorshavn
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7/9/29
10°
30'
28'
30'
27'
NORDENSKIÖLD GLACIER
AND
PETERMANN PEAK
From a survey by R.C.Wakefield & A.Courtauld
supplemented by photographs.
Scale 1: 250.000
5 0 5
Statute Miles
Heights in feet, instrumental 6870
" " " estimated (7500)
FRÆNKEL PEN.
Franz Josef Land
Nathorst Pk
(8480)
Cairn
Riddarborgen
5906
Camp 1
Camp 6
Monte Silvio
(7650)
Cambridge
1
7155
2
6680
Peaks
3
7547
4
7300
7440
Camp 2
5
Camp 8
Battlements
Camp 4
Lion
astion
(7600)
Camp 5
Sentinel
7900
Knuckle
(8020)
The Knoll
7280
Camp 3
Outlook Col
(7860)
Outlook Pk
7885
Snow Dome
7530
Mt
Lauge Koch
8295
SUESS
LAND
ountainous region
6000 to 8000 ft
10
73

Petermann Pk
9650
Ymer Island
Suess Land
Skiltvakten
Ella I.
Lyell Land
Tinnaire
Berzelius Mt
5800
C. Moerkel
6750
Arwidsson I.
C. Petersens
Syltoppene
6850
4000
Werner Mts
Pictet Mts
Geographical Society Island
Mt Laplace
4880
Mt Leitch
3000
Mt Freycinet
4600
Scott Keltie I.
Nordenskiöld I.
C. Palander
Traill Island
Craig Is
3840
4430
C. Humboldt
Broch Islands
Bontekoe I.
1100
C. Mackenzie
C. Mc Clintock
Franklin I.
C. Parry
Cleft I.
C. Young
C. Moorsom
C. Simpson
SCORESBY LAND
C. Biot
C. Brewn
Canning Land
C. Fletcher
Murray I.
3000
3600
Rink Mountains
Renland
Bear Islands
Jameson Land
Klitdal
3200
3800
Liverpool
C. Grey
Coast
Milne Land
5000 - 6000
5800
7300
6000
7000
C. Leslie
Donmark I.
Hekla Hr
C. Stevenson
5000 6000
Gaase Land
2300
2850
4600
Rathbone I.
2000
C. Swainson
C. Tobin
C. Stewart
C. Hope
C. Brewster
1050
6000
Steward I.
5000
Turner I.
3300
3700
3800
1300
C. Dalton
Scale 1:2.000.000
50 0 50
Statute Miles
Heights in feet (approx.)
73°
72°
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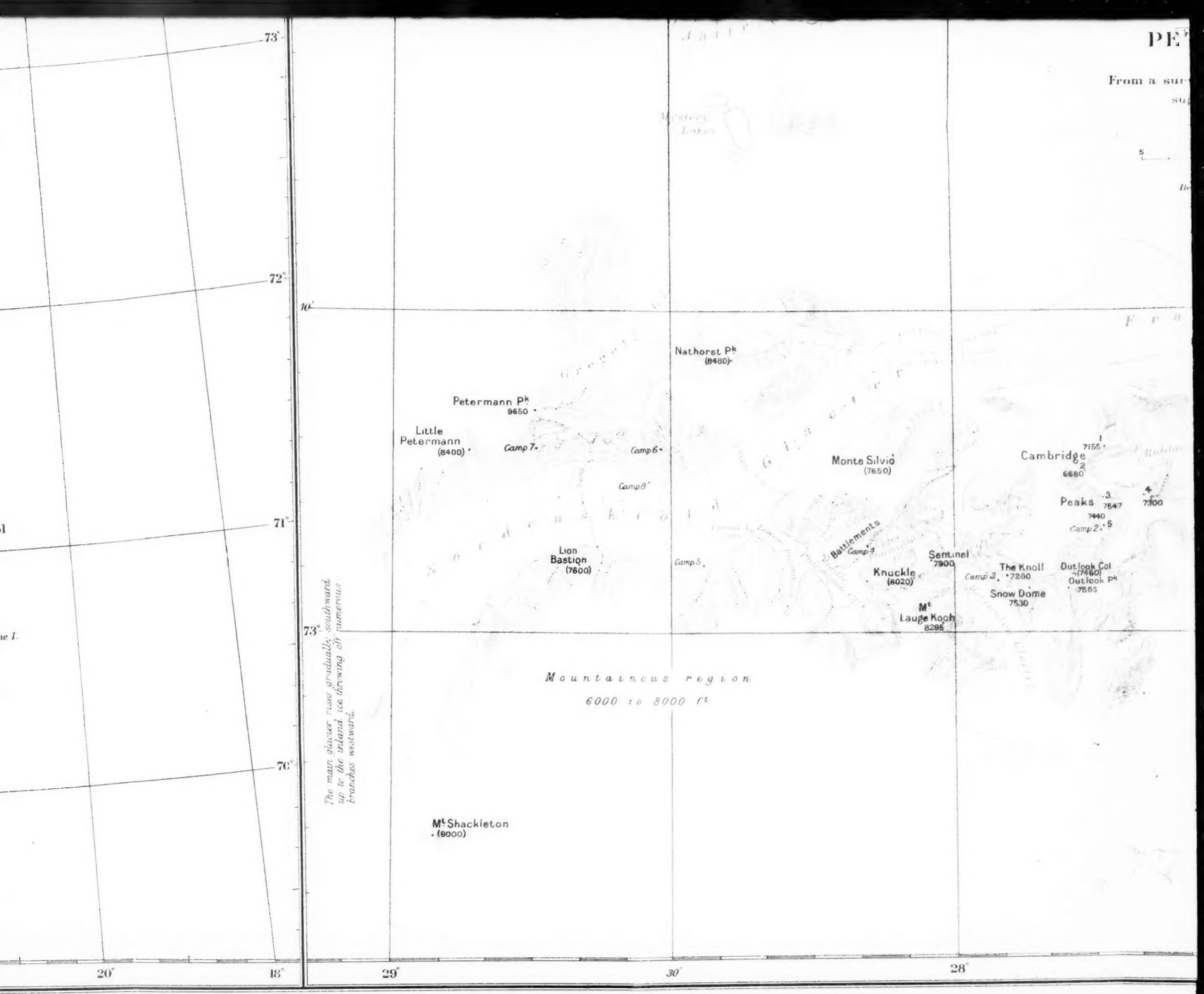
KING CHRISTIAN IX LAND



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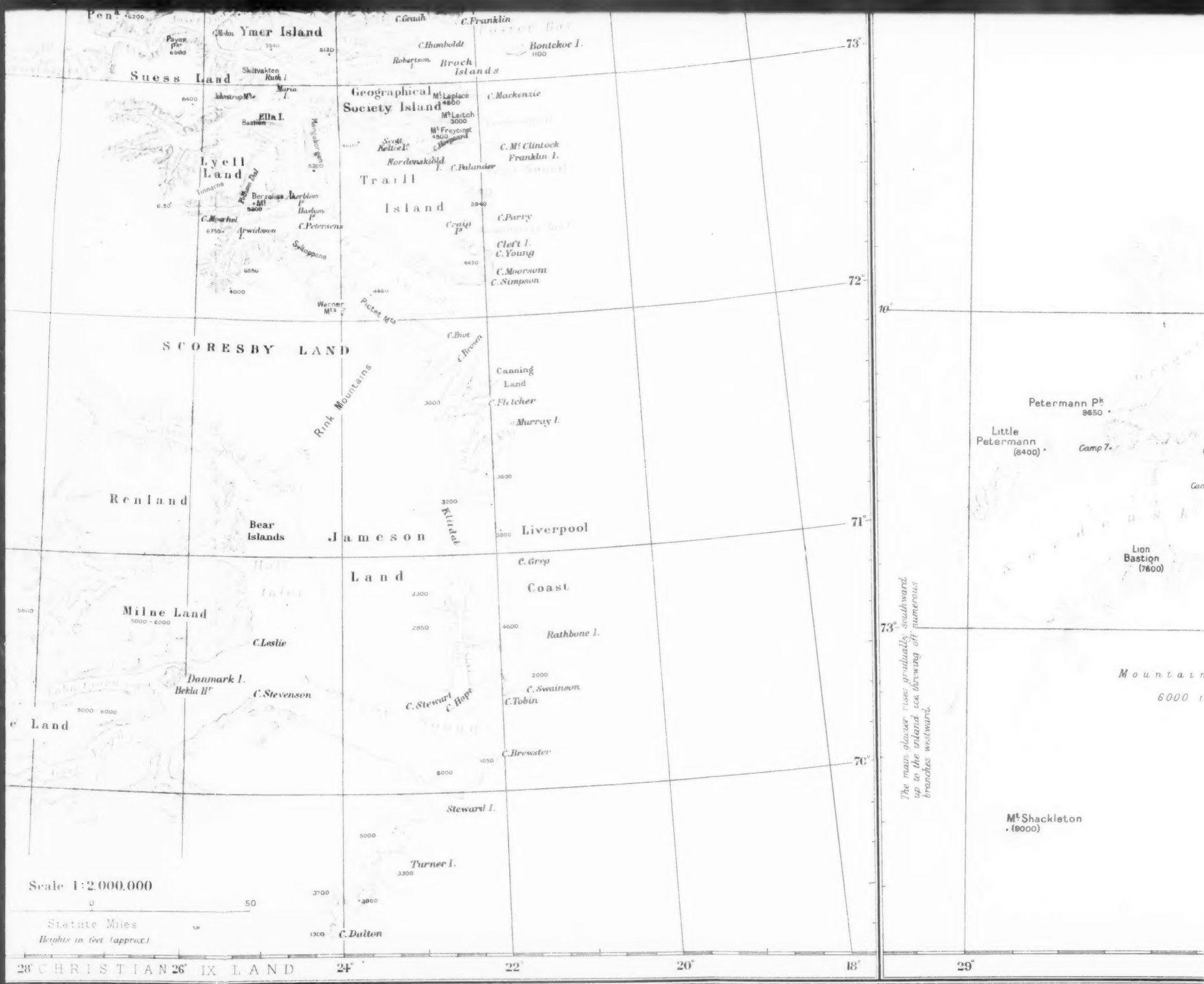

Published by the Royal Geographical Society

AND

PETERMANN PEAK

From a survey by R.C. Wakefield & A. Courtauld
supplemented by photographs.

Scale 1: 250.000

5 0 5

Statute Miles

Heights in feet, instrumental 6870
" " " *estimated* (7500)

KEE PENA

10'

Nathorst Pk
(8480)

Cairn

Riddarborgen
5906

Camp 7

Camp 6

Monte Silvio
(7650)

Cambridge
7155 1
2
6680

Camp 8

Peaks 3 4
7547 7300
7440

Camp 2 5

Battlements

Camp 4

Camp 5

Sentinel
7900

Knuckle
(8020)

The Knoll
7280

Camp 3

Outlook Col
(7480)

Outlook Pk
7885

Snow Dome
7530

Mt
Lauge Koch
8285

SUESS

73

trainous region
6000 to 8000 ft

LAND

30' 28' 30' 27'

EAST GREENLAND
Wordie

UNIV. OF MICH.

ROYAL GEOGRAPHICAL SOCIETY: BUILDING FUND

Since the last statement of the Fund the Treasurer has had the pleasure to acknowledge the receipt of £50 from Lady Eckstein and Mr. Cecil Polhill, £25 from Lady Rawlinson, £20 from Mr. E. F. De Rougemont, Mr. Nabeshima, and Mr. H. P. Vacher, making with many contributions of smaller amount a total of £18,180 from 1392 subscribers on May 23. All Fellows who had not already subscribed have now received the President's individual appeal, to which there has been the considerable response recorded month by month. But it will be noted that there are still over 5000 Fellows who have not contributed: and about £2000 is still required to complete the Fund.

During May the building has made good progress. The roof is finished and the windows in process of glazing. Plastering is in full swing and the heating installation practically complete. Seating for the Hall has been approved and steel map cases for the lower Map Store ordered. But the last contracts for equipment and furnishing cannot be made until funds allow.

By Order of the Council,

ARTHUR R. HINKS, *Secretary.*

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EVENING MEETINGS IN THE AEOLIAN HALL

Monday June 2 at 8.30 p.m.
A JOURNEY IN THE RUB AL KHALI. *By Mr. Bertram Thomas* (*Read for the author by Sir Arnold Wilson*)

Monday June 16 at 8.30 p.m.
THE GEOGRAPHY OF PETRA AND EDOM. *By Mr. George Horsfield*

ANNUAL GENERAL MEETING IN THE AEOLIAN HALL

Monday June 23 at 3 p.m.
PRESENTATION OF THE GOLD MEDALS AND AWARDS: THE PRESIDENT'S ADDRESS: ANNUAL REPORT OF THE COUNCIL: ELECTION OF PRESIDENT, OFFICERS, AND COUNCIL.

ANNUAL DINNER

The ANNUAL DINNER will be held at the Connaught Rooms, Great Queen Street, Kingsway, on the evening of Monday June 23, at 7.30 for 7.45 p.m. Tickets for Fellows and their Guests (one guinea each, including red and white wine) may be obtained on application to the Chief Clerk at the House of the Society. Early application is desired. The plan of the tables will be made on the morning of Thursday June 19.

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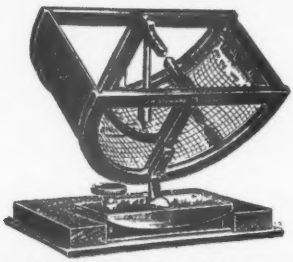

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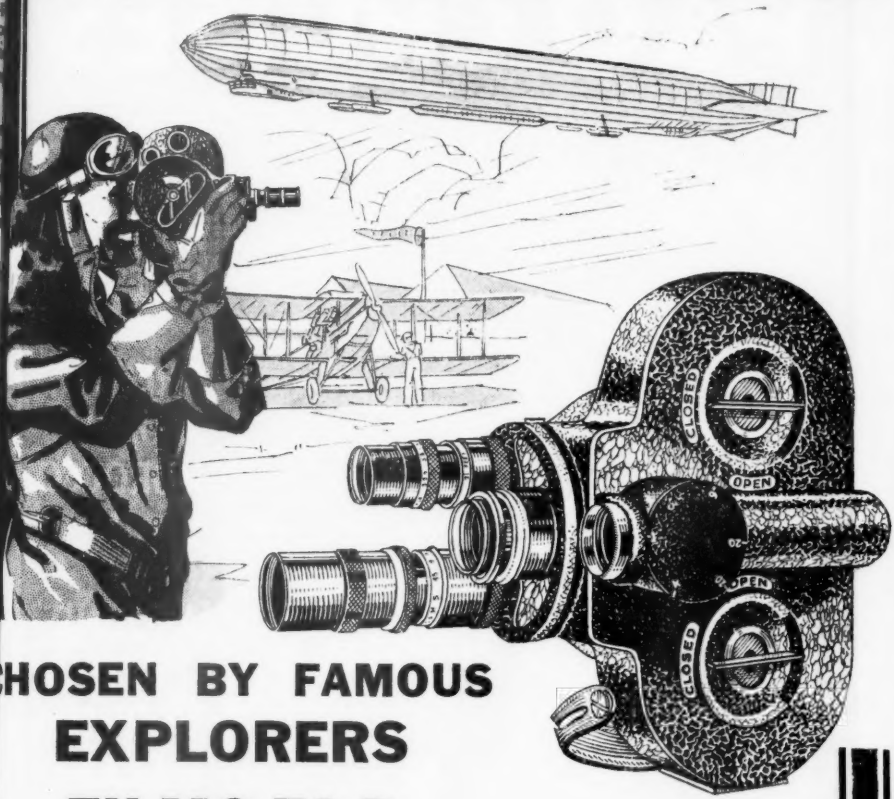

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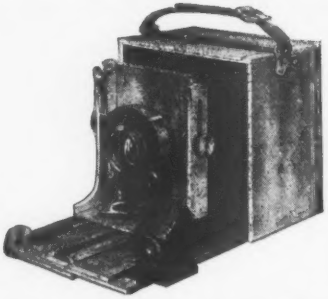

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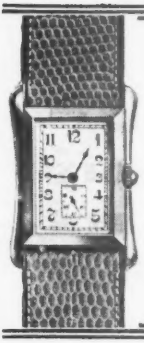

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